ΤΕΕ
ΤΕΧΝΙΚΟ ΕΠΙΜΕΛΗΤΗΡΙΟ ΕΛΛΑΔΑΣ

AIDIGITS

BIM Academy

BIM AND DIGITAL TRANSFORMATION

INDUSTRY 4.0 TECHNOLOGIES

CONSULTANT AND SERVICES PROVIDER

23/OCT/2025 ISSAM ELABSI

DIGITAL TRANSFORMATION / ARTIFICIAL INTELLIGENCE IN STRUCTURAL ENGINEERING / SIMULATION AND OPTIMIZATION

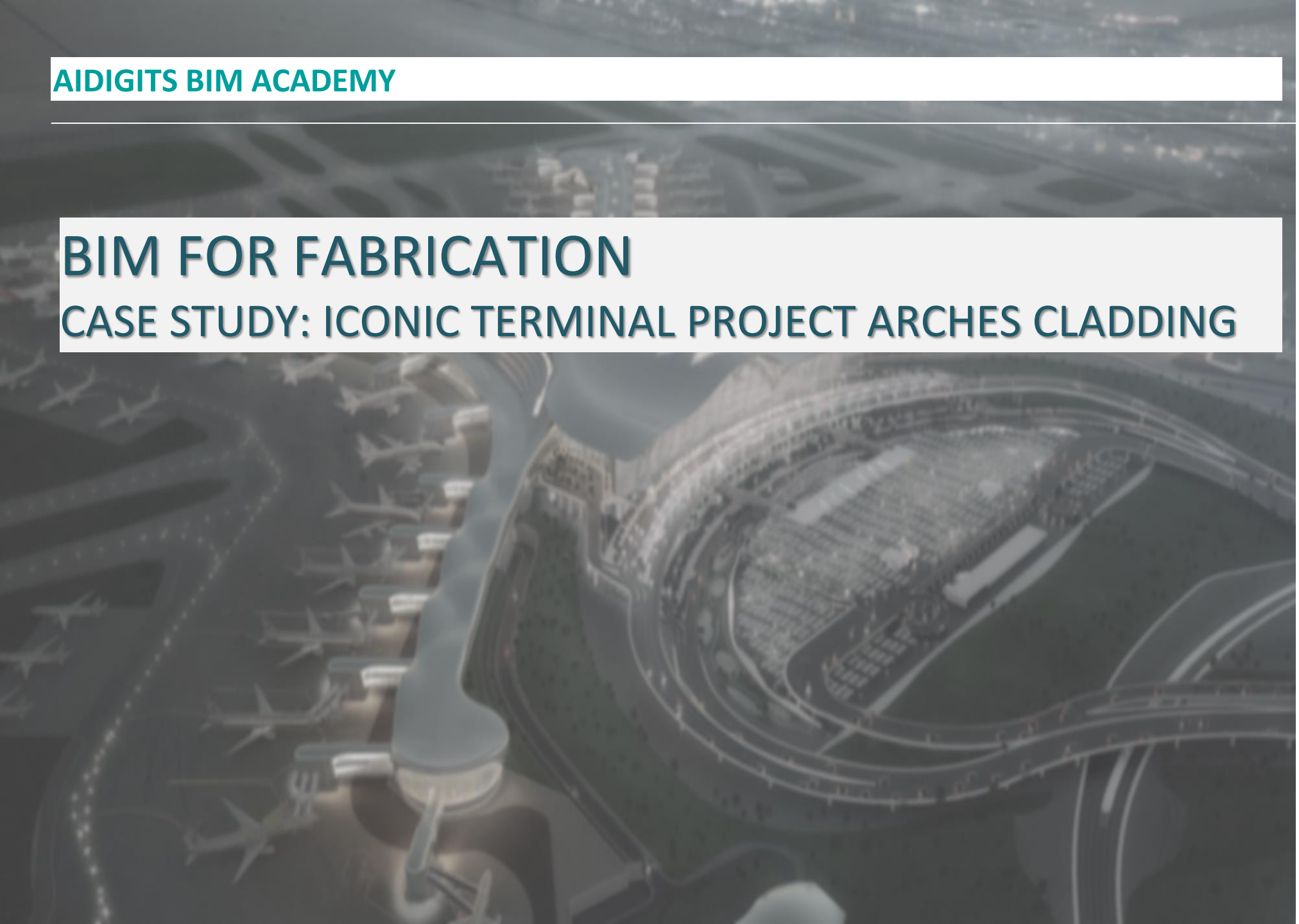
OPTIONEERING AI TOOL

FABRICATION AI TOOL

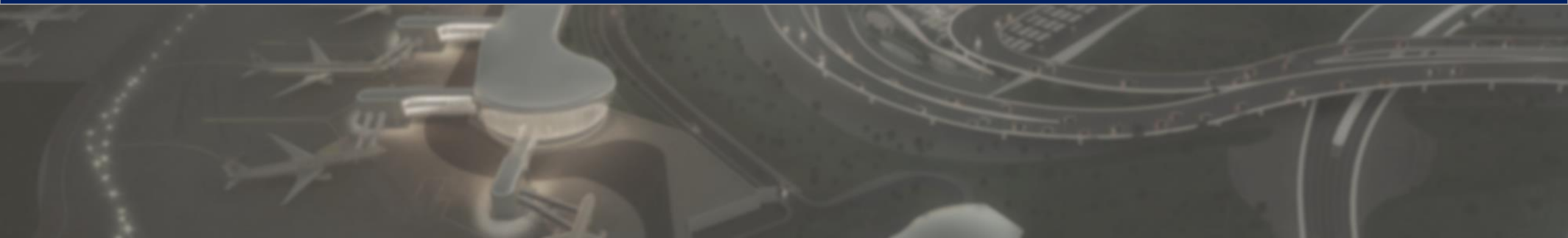
AIDIGITS BIM ACADEMY

BIM FOR FABRICATION

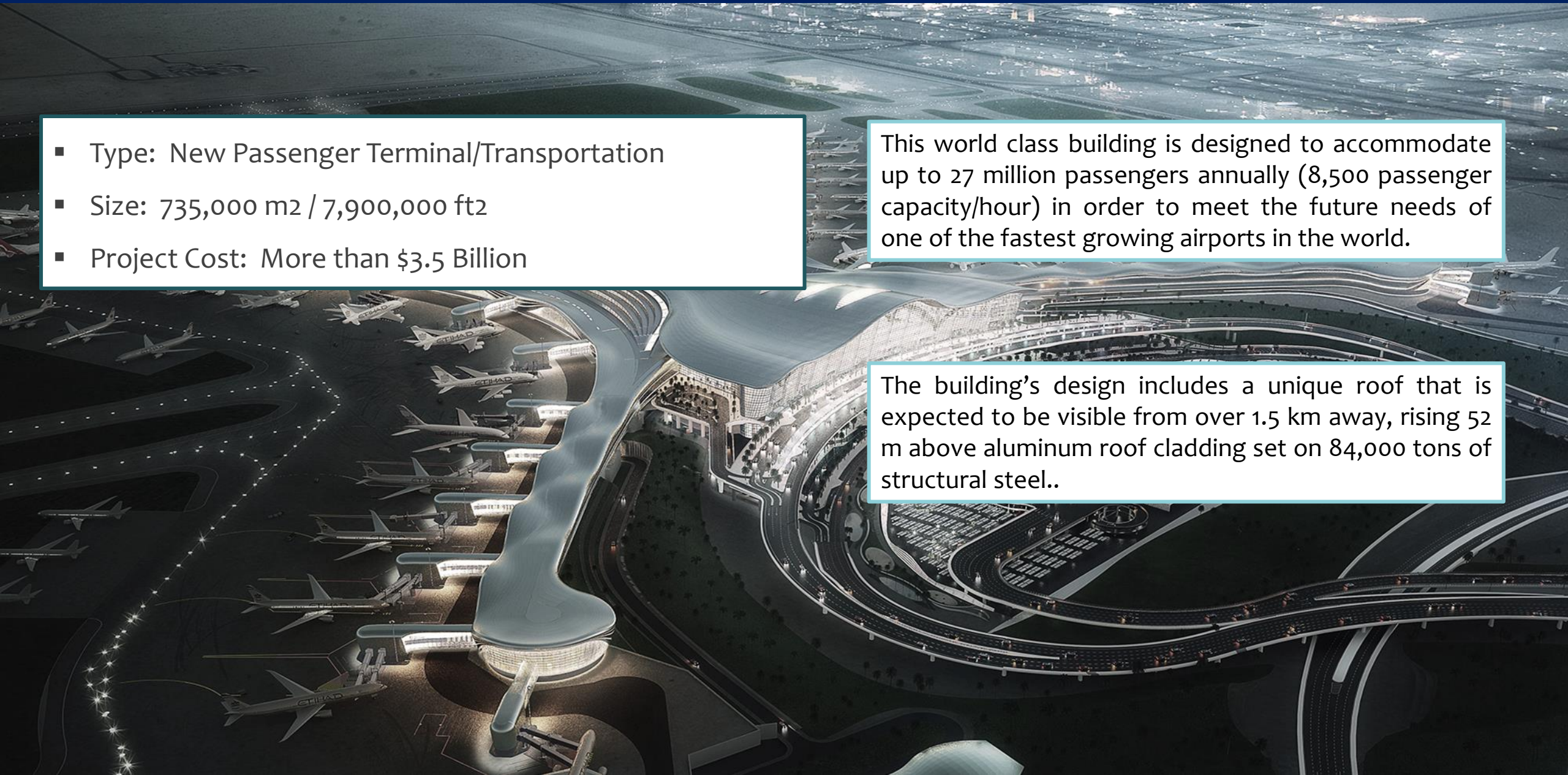
CASE STUDY: ICONIC TERMINAL PROJECT ARCHES CLADDING



► LAYOUT



▶INTRODUCTION

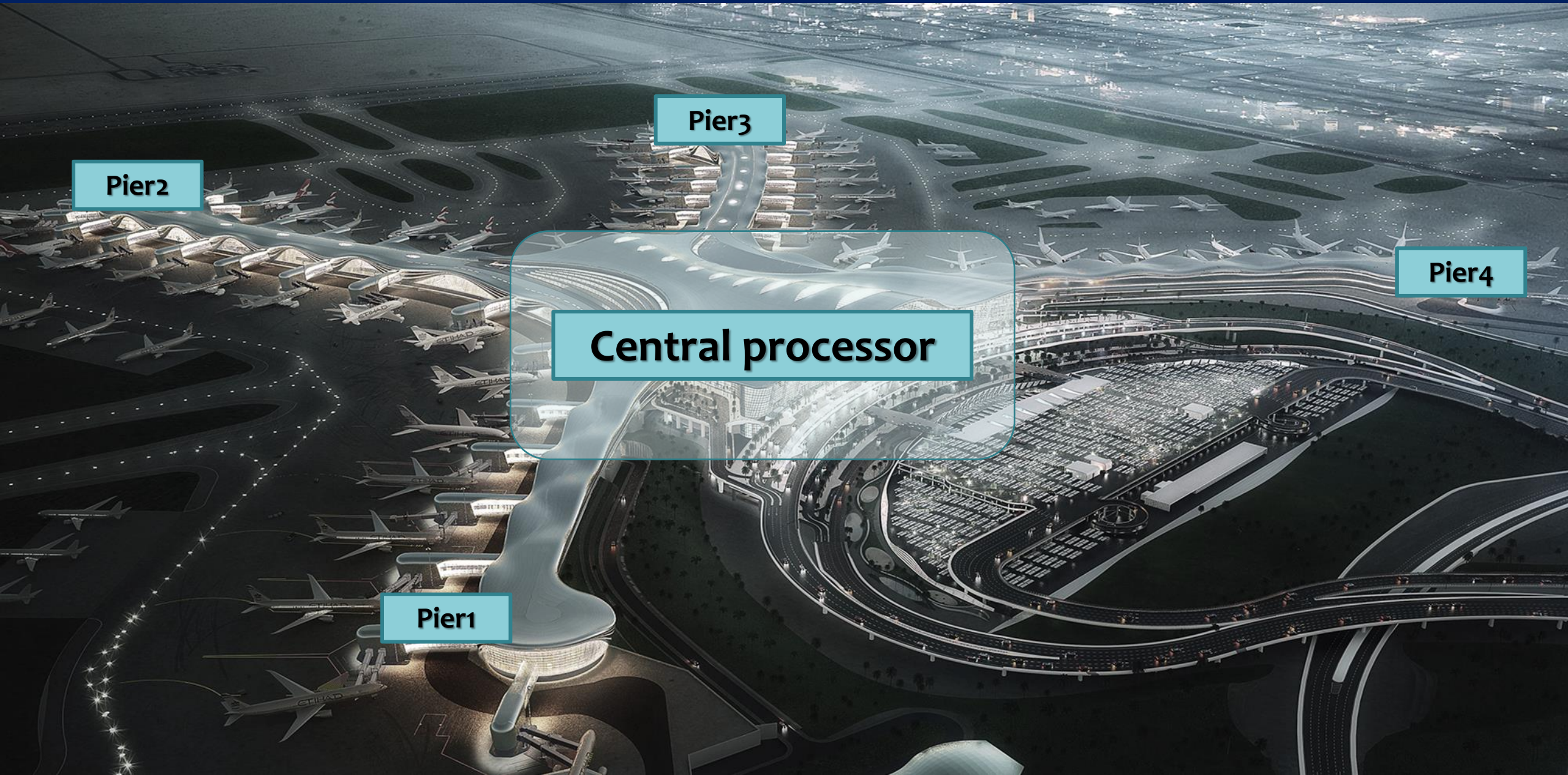


- Type: New Passenger Terminal/Transportation
- Size: 735,000 m2 / 7,900,000 ft2
- Project Cost: More than $3.5 Billion

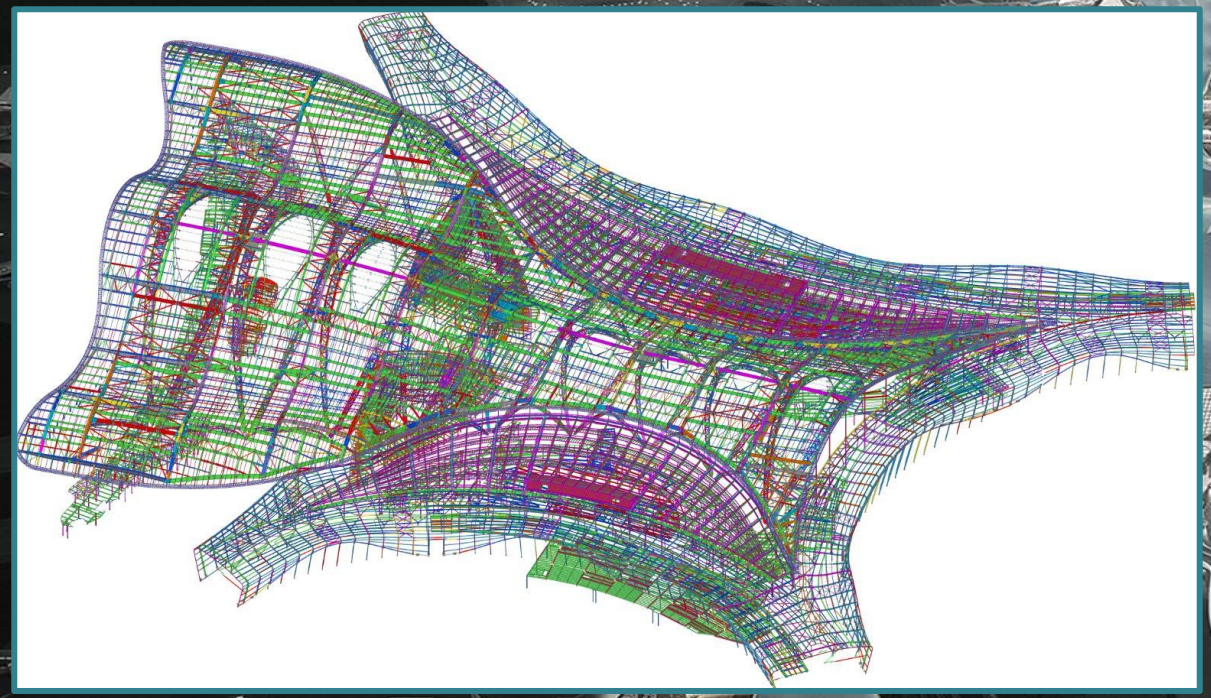
This world class building is designed to accommodate up to 27 million passengers annually (8,500 passenger capacity/hour) in order to meet the future needs of one of the fastest growing airports in the world.

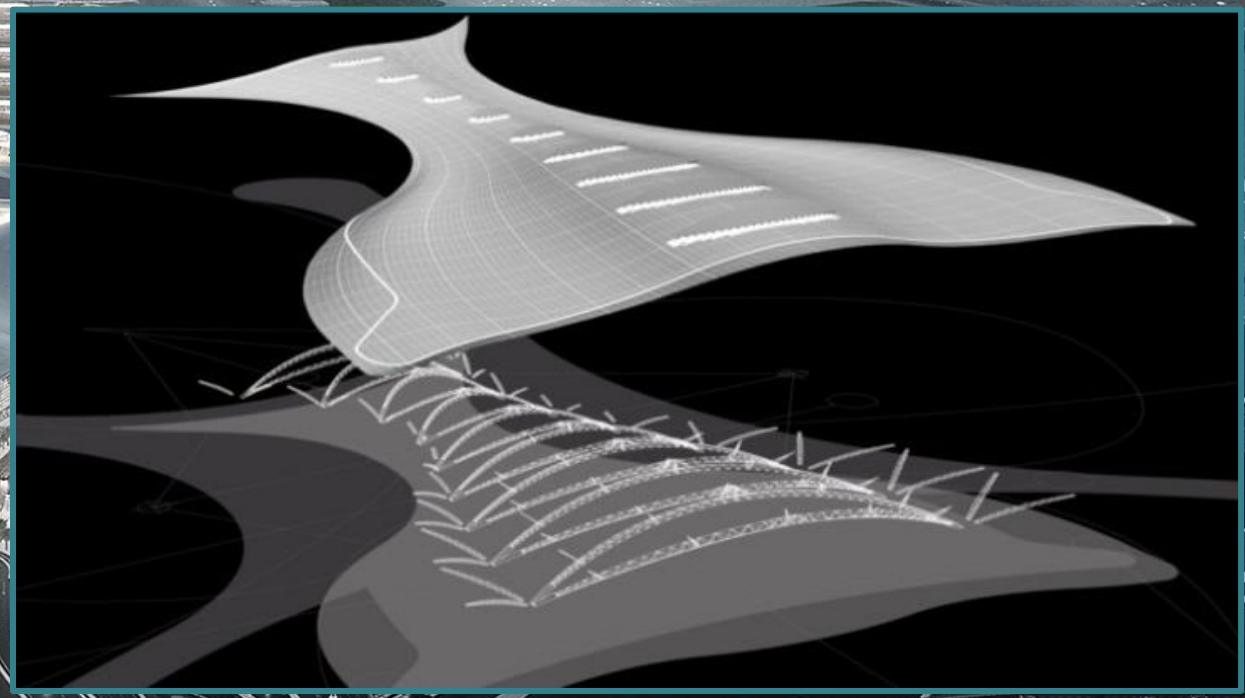
The building's design includes a unique roof that is expected to be visible from over 1.5 km away, rising 52 m above aluminum roof cladding set on 84,000 tons of structural steel..

►INTRODUCTION



Central processor

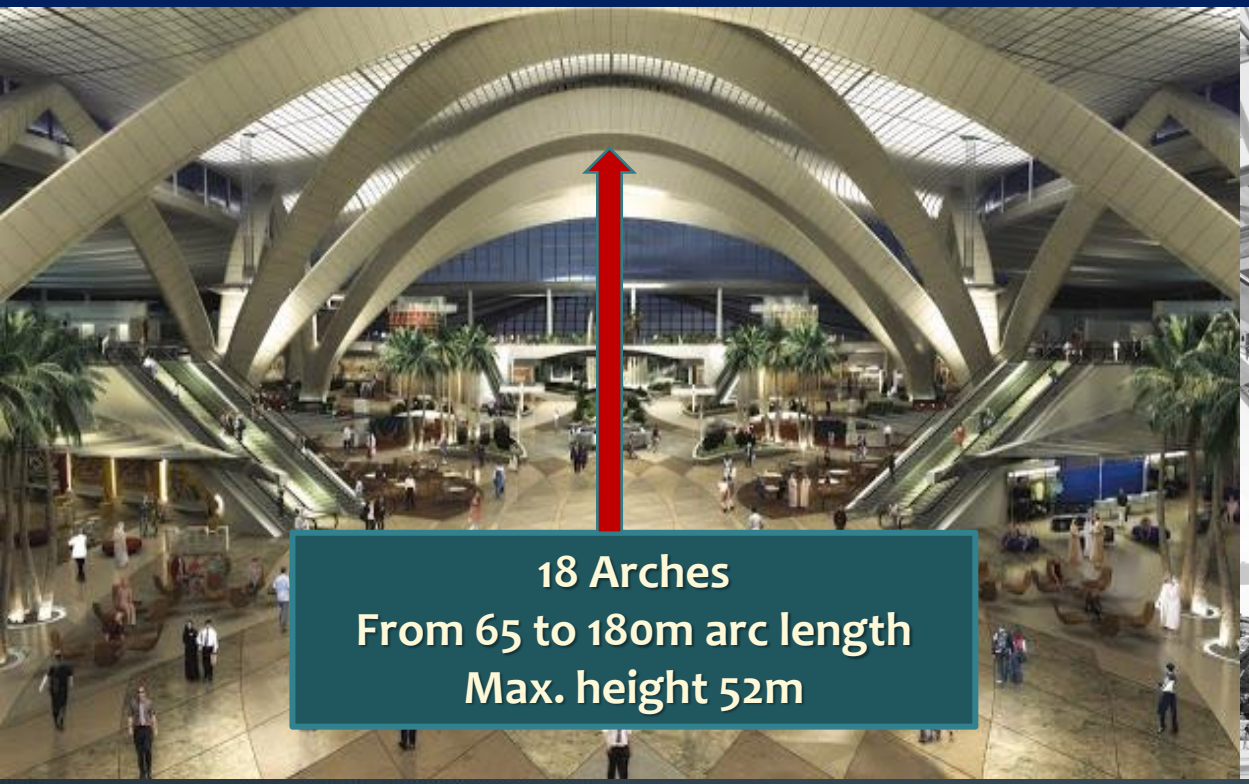


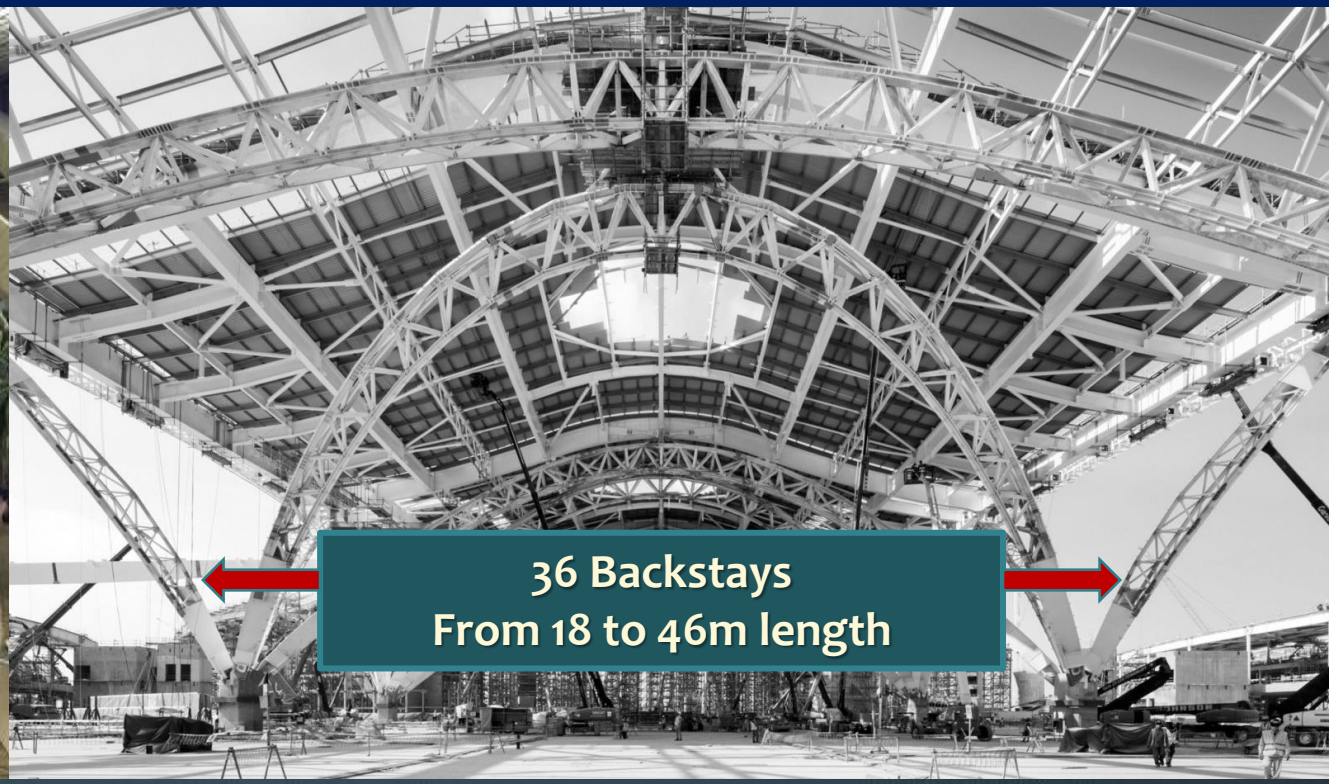


The steel structure that will support central processor's roof is 319m at its widest point

Roof is composed of 18 curved steel arches, the biggest span of single arch up to 180 meters, with 50 meters in height and self-weights around 800 tons

▶SCOPE OF WORK

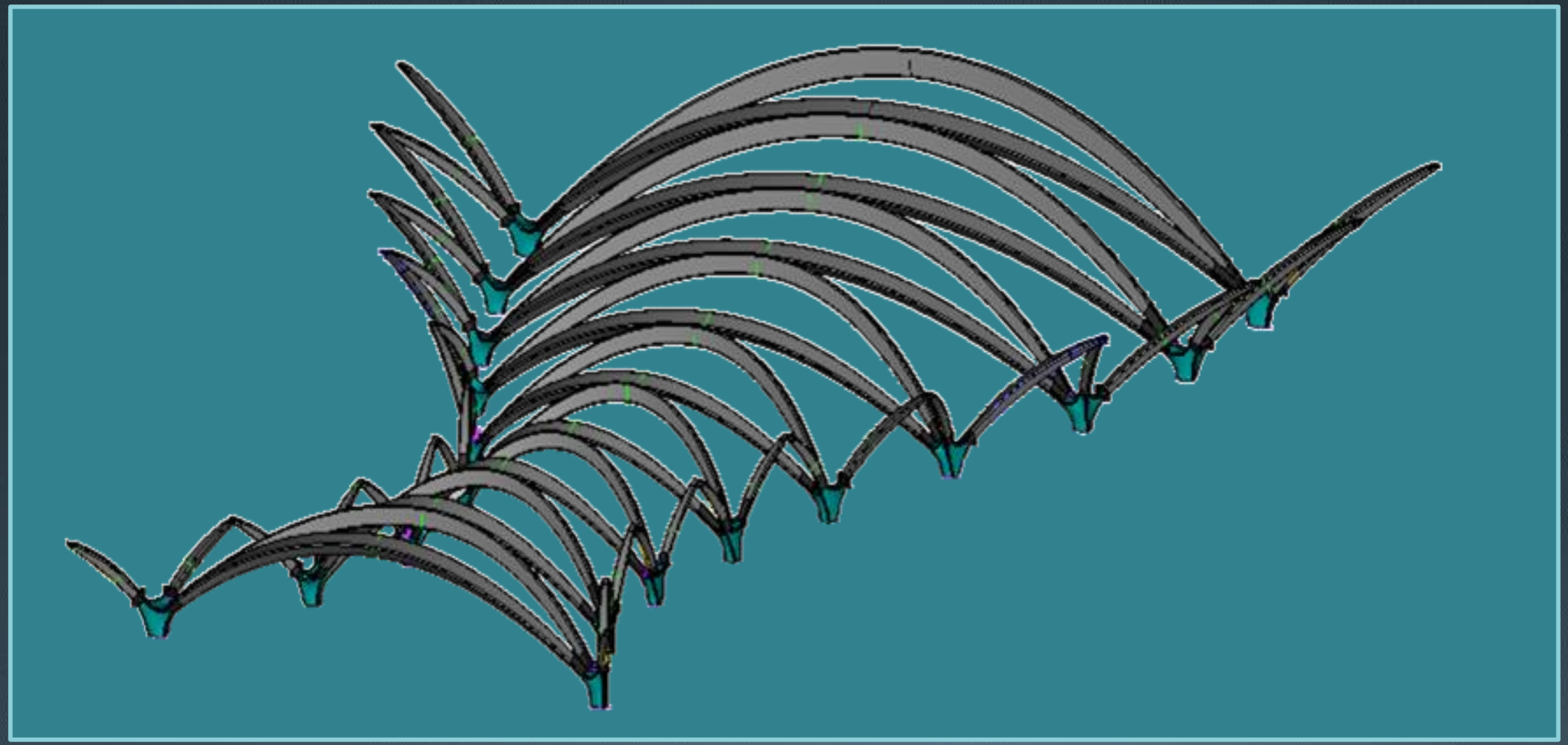




- Development of 18 Arches and 36 Backstays cladding and supporting system BIM Models in LOD400
- Coordination with main steel structure, Chandeliers and cameras
- Extract of work orders, which include all necessary information for accurate fabrication of panels and aluminum frames

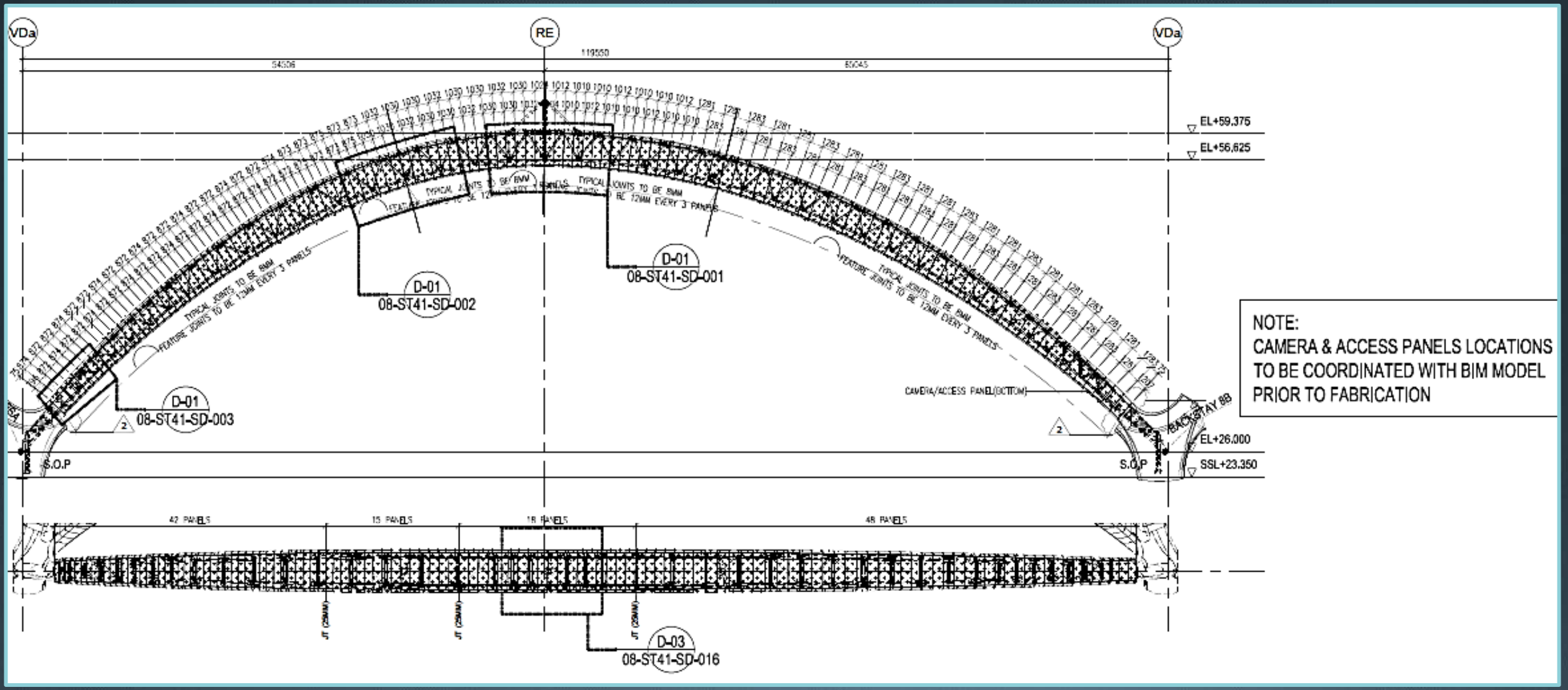
►WORKFLOW – INITIAL DATA

Surface setting out model (from designers)



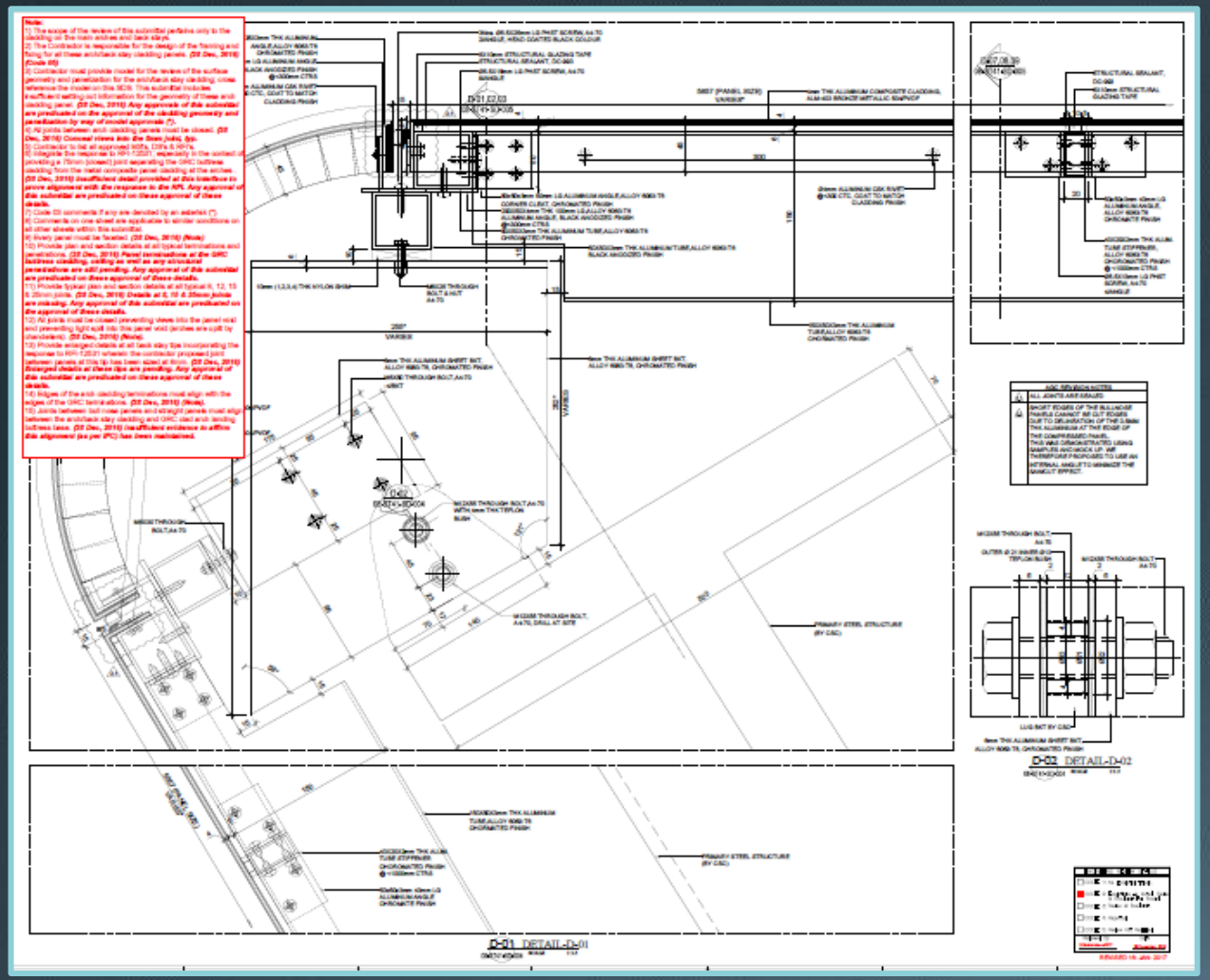
▶WORKFLOW – INITIAL DATA

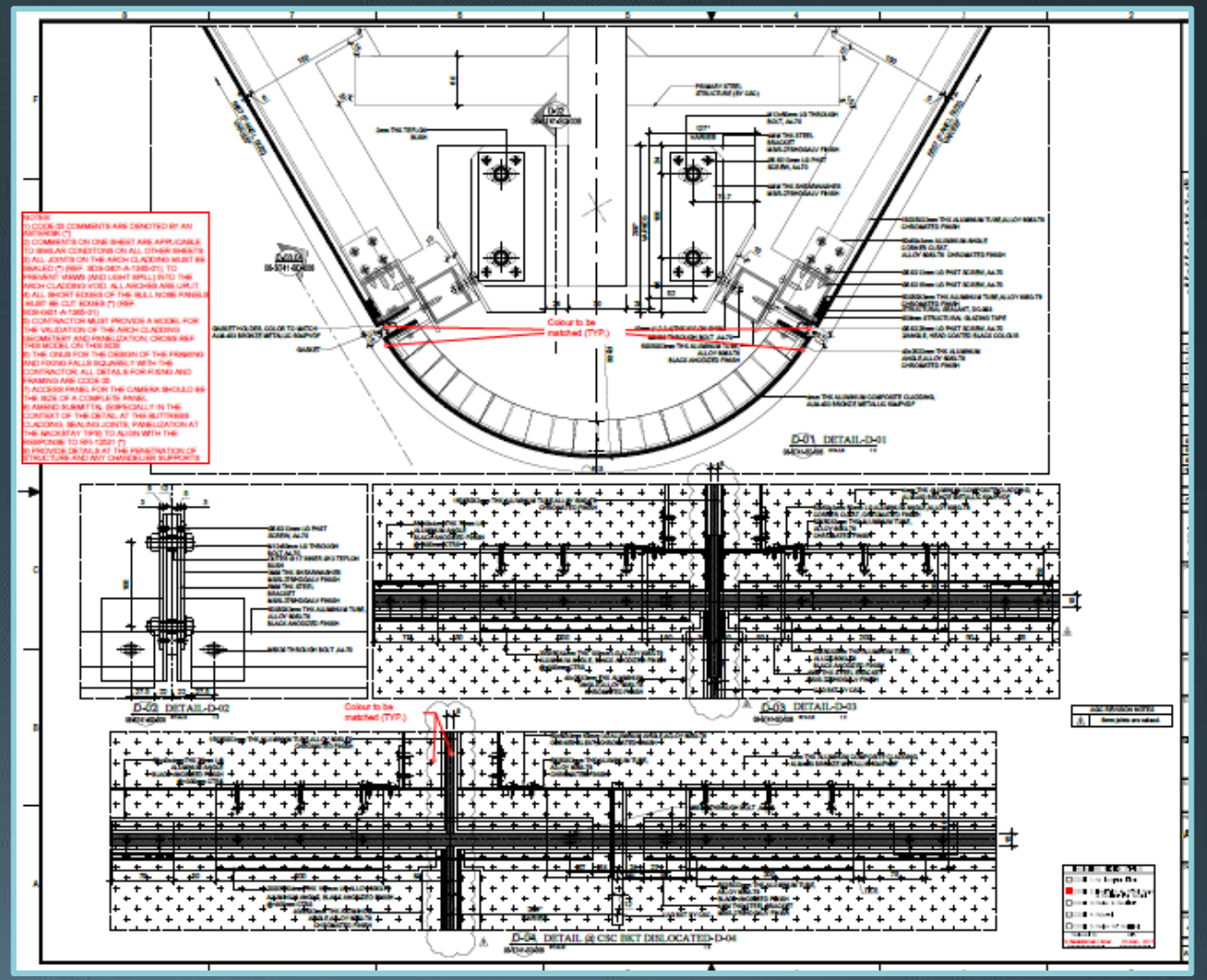
Elevations and plans



►WORKFLOW – INITIAL DATA

Supporting system details





▶WORKFLOW – EDGE LINES EXTRACTION FROM SETTING OUT MODEL

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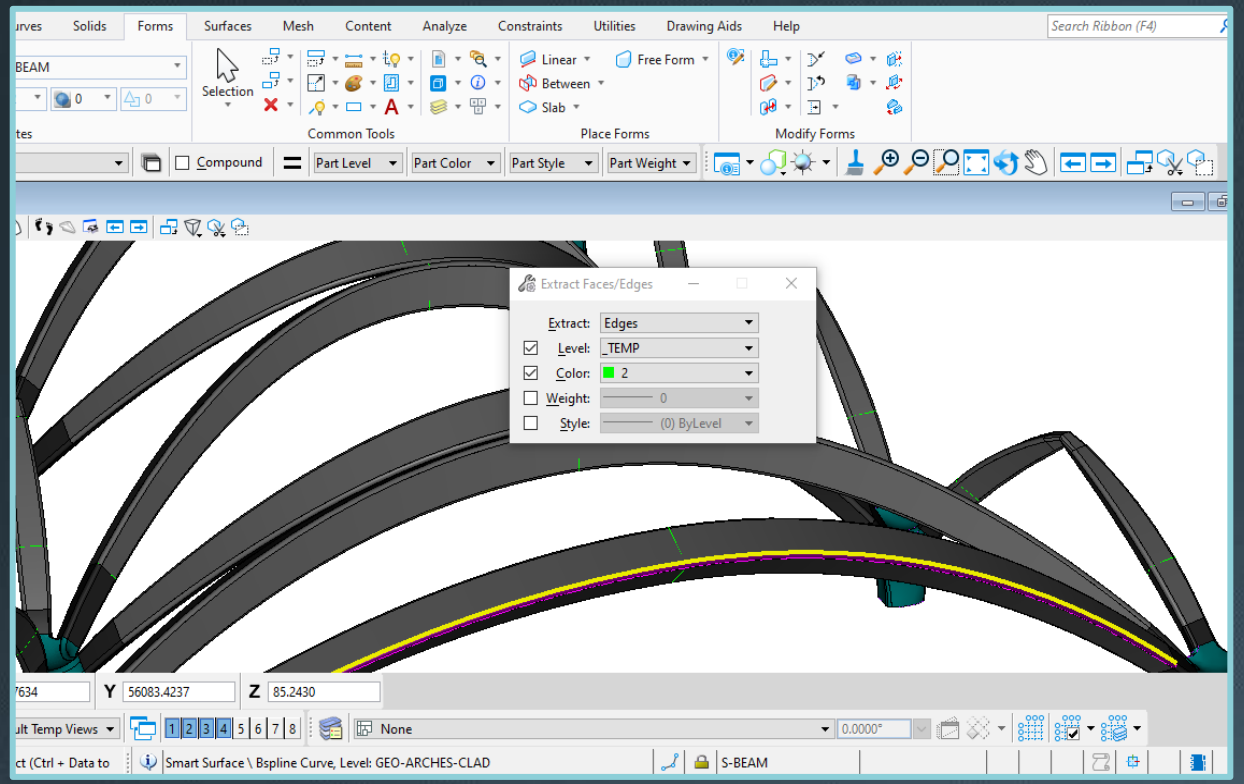
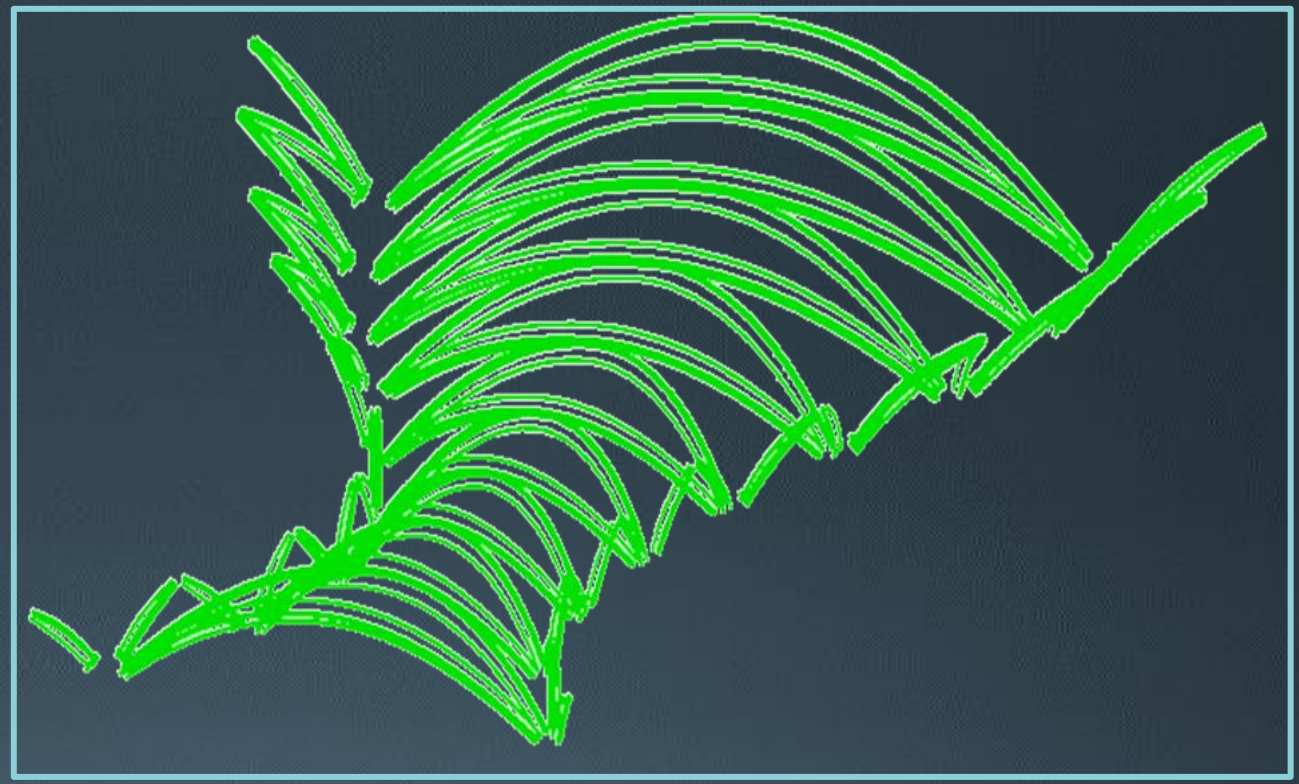
Extract edges (centerlines)

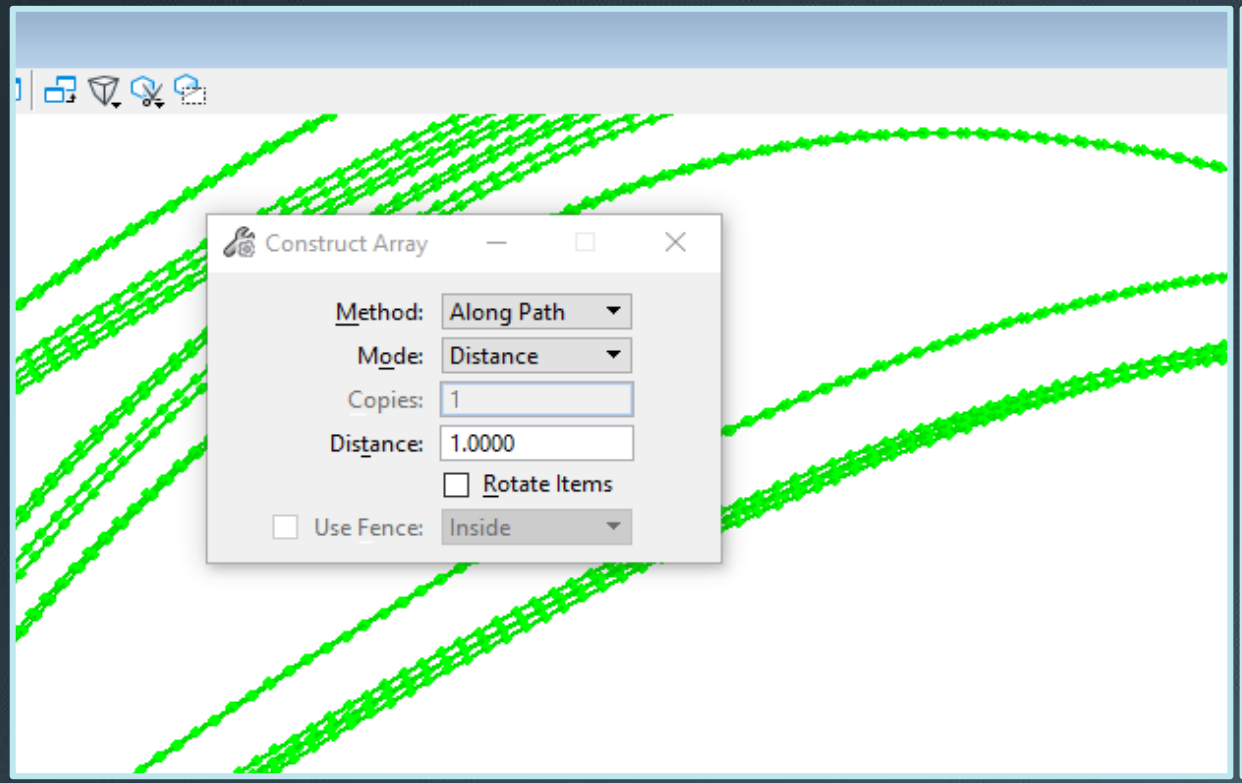


Edge lines model



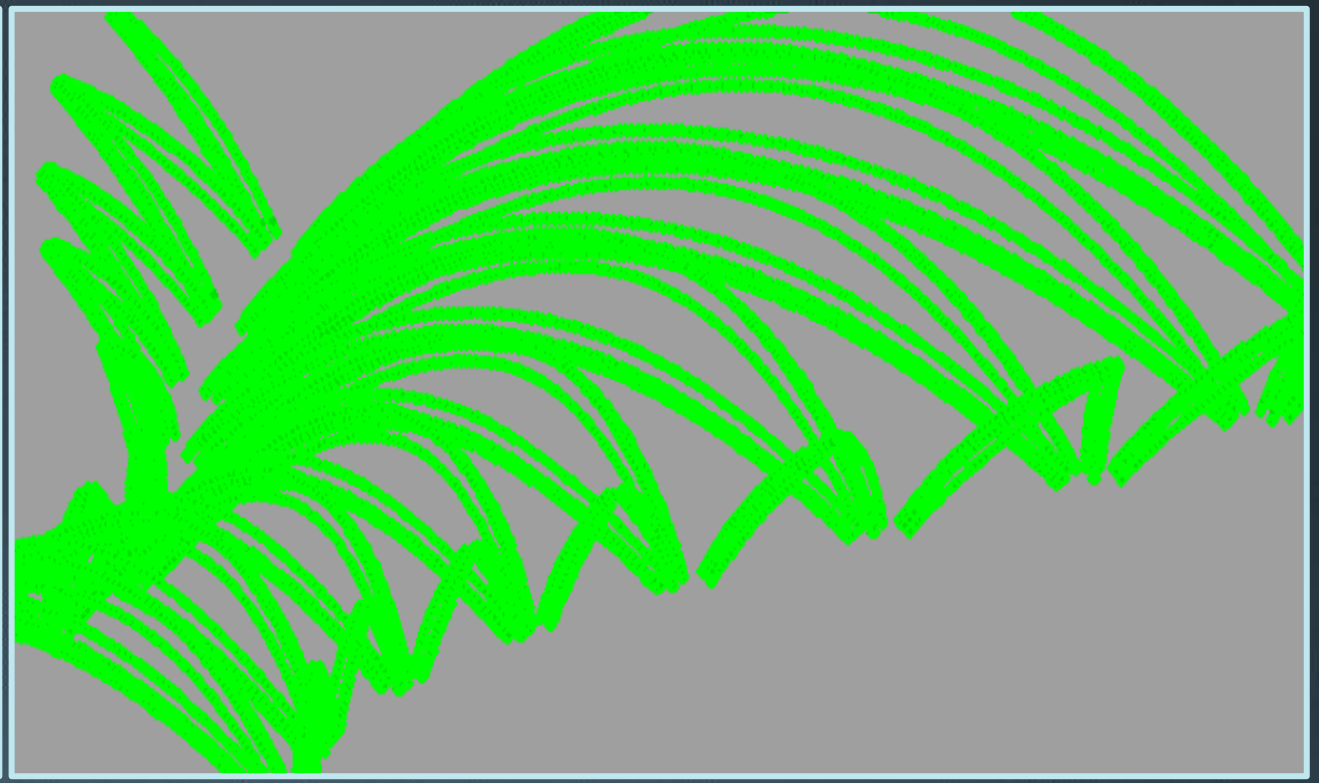
▶WORKFLOW – GREEN POINTS CREATION ALONG EDGE LINES

Green points creation along edge line



Green points creation using “array” tool according to 2d panels division dimensions. These points represent the edges of the panels

Green points model

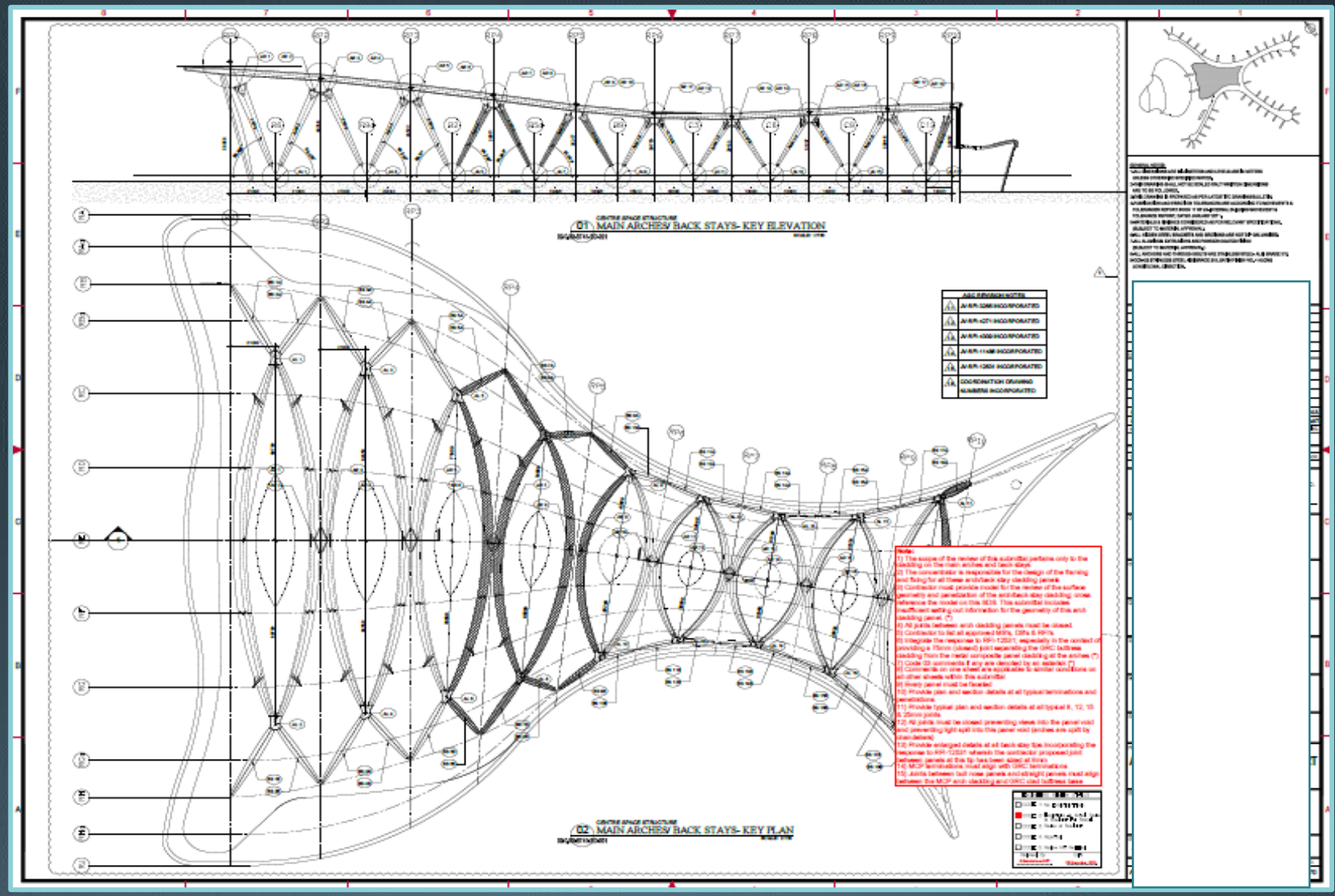


Green points will be the basis for automation tools

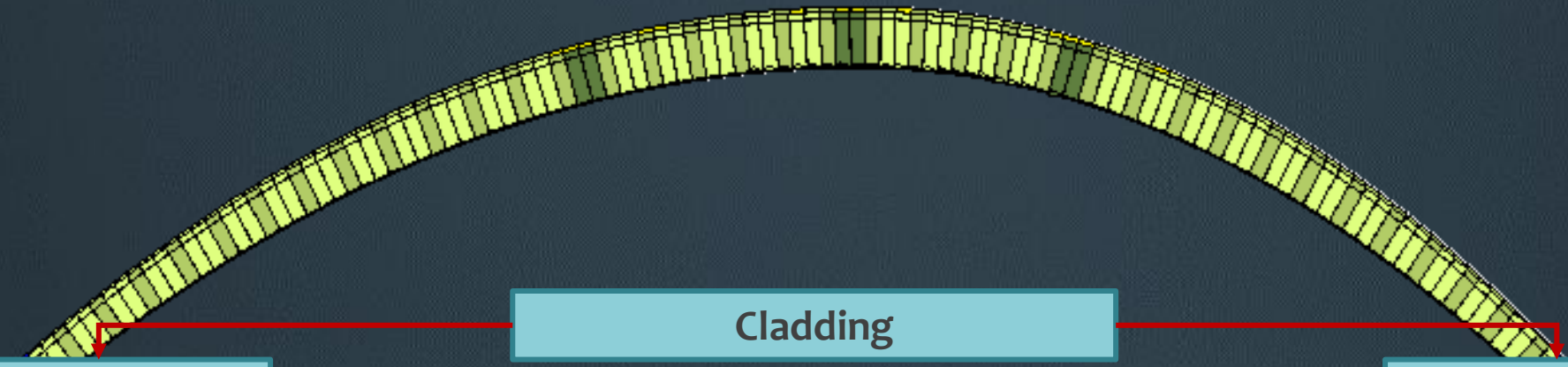
►WORKFLOW – DIVISION OF MODELS

Model was divided in the 18 Arches and 36 Backstays

Total number of models to be developed: 54 BIM Models

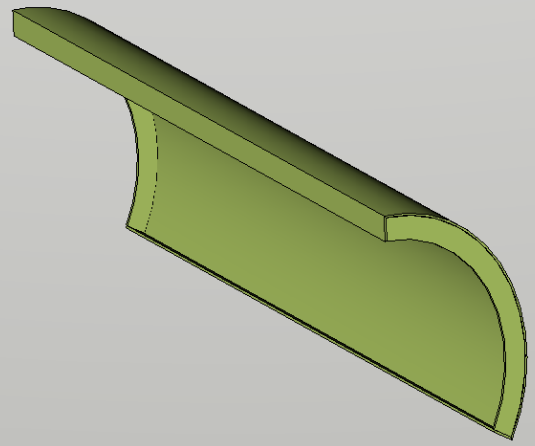


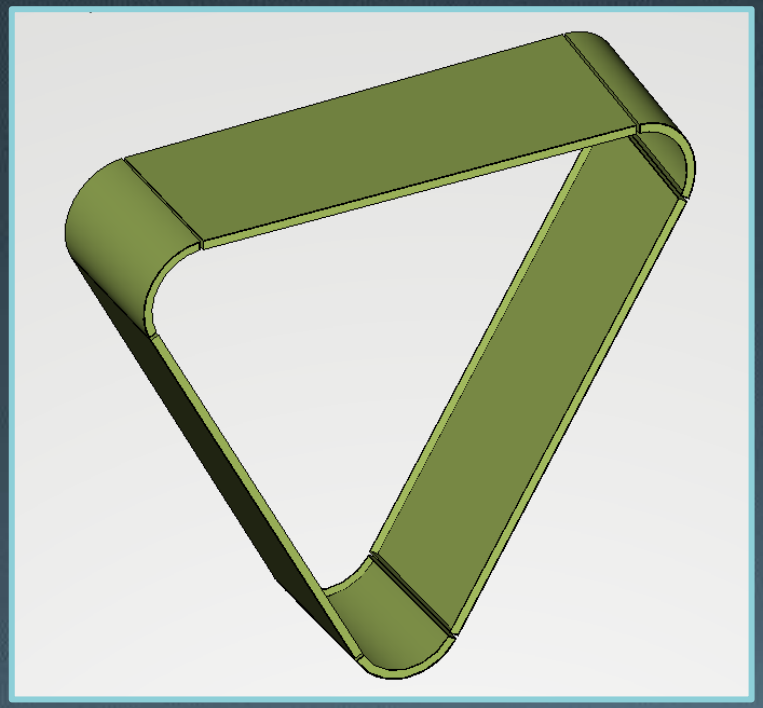
►WORKFLOW – WHAT NEEDS TO BE CREATED



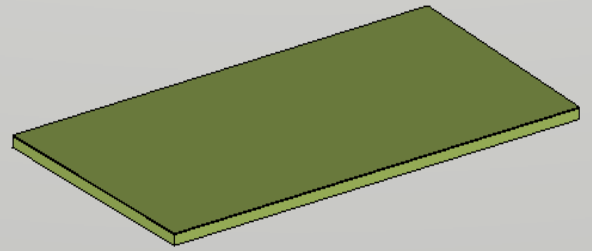
Cladding

Curved panels



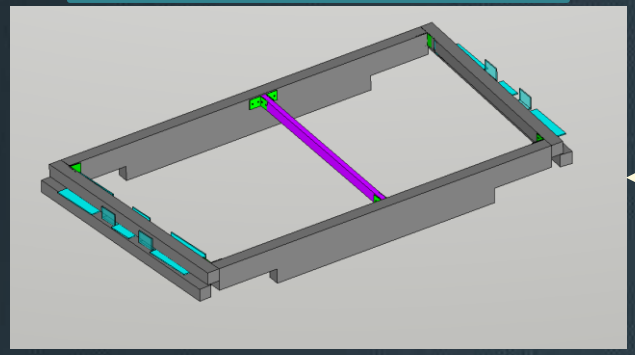


Flat panels

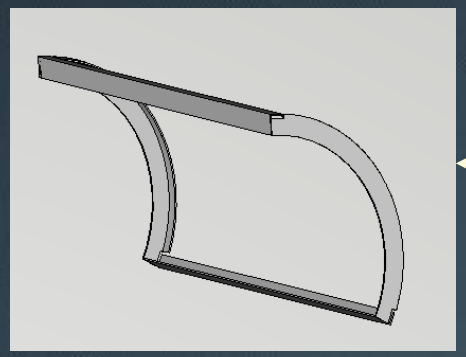


►WORKFLOW – WHAT NEEDS TO BE CREATED

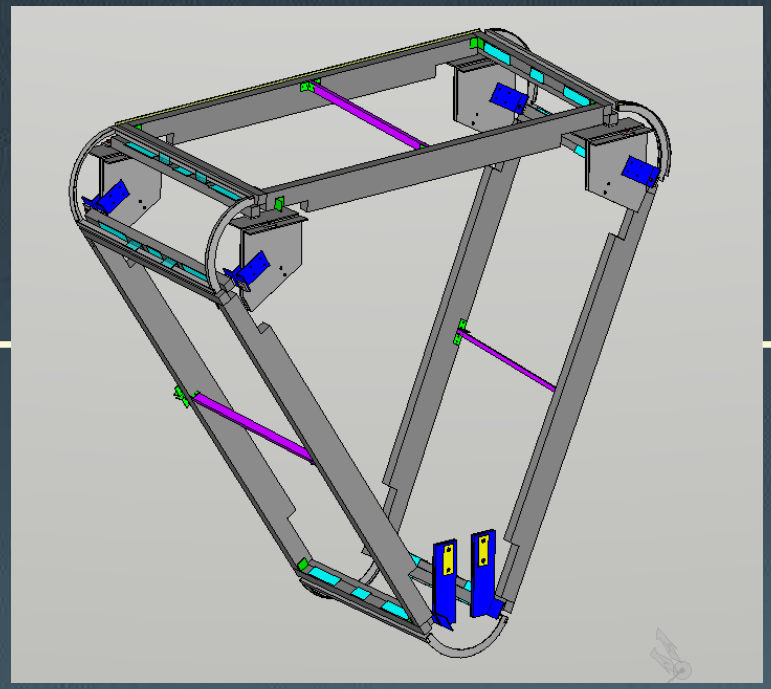
Flat panels subframe



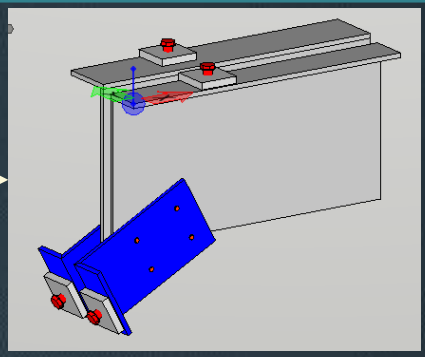
Curved panels subframe



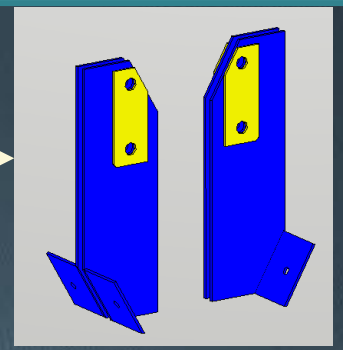
Cladding supporting system



Top Connection to steel structure



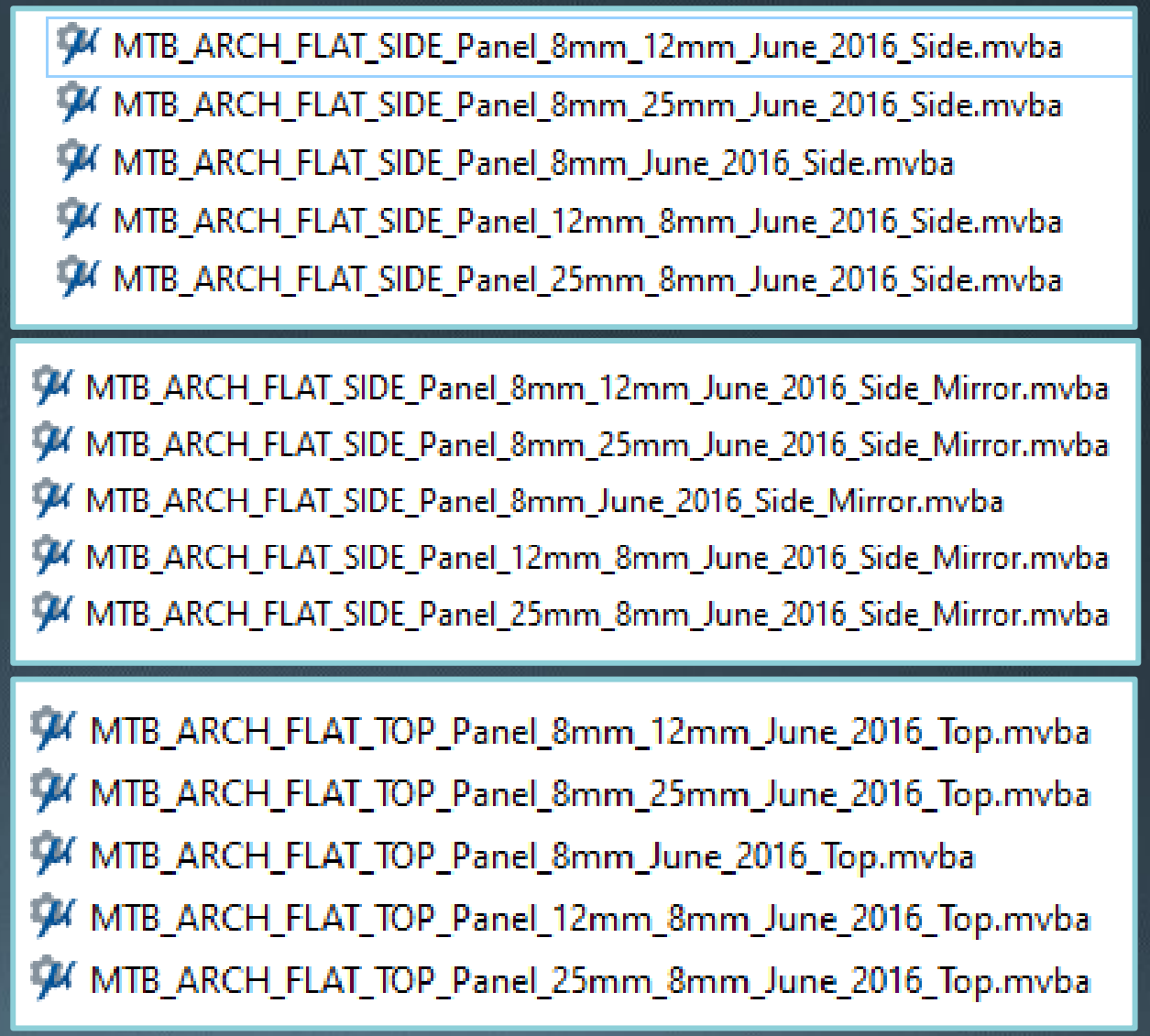
Bottom Connection to steel structure



►WORKFLOW – AUTOMATION TOOLS

A set of macros was created using VBA for creation of the following:

- Curved lines for curved panels
- Curved panels
- Top panels
- Side panels
- Mirror side panels
- Top fixation
- Bottom fixation

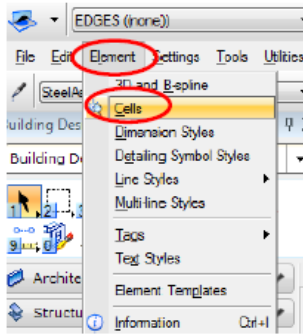


▶WORKFLOW – GUIDELINES

1) GENERAL GUIDELINES

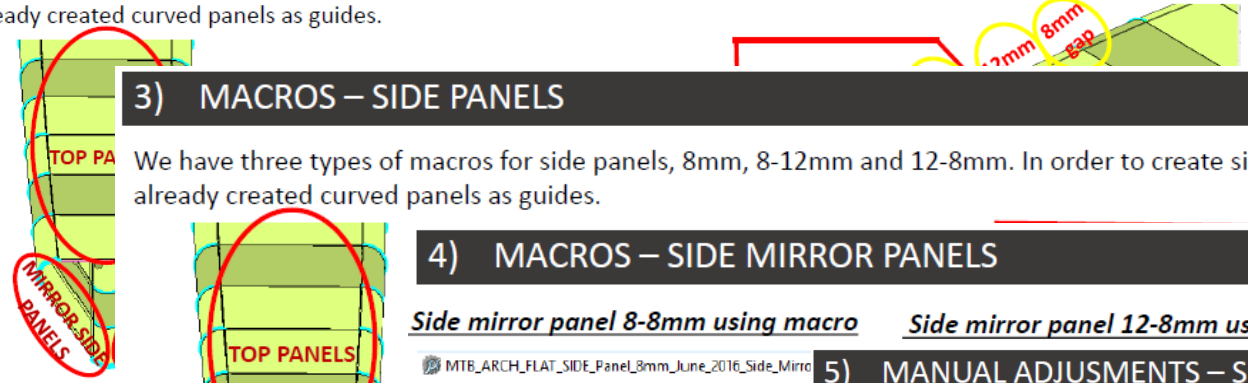
We should import some settings before we start running the macros

i. We load the cell libr



2) MACROS – TOP PANEL

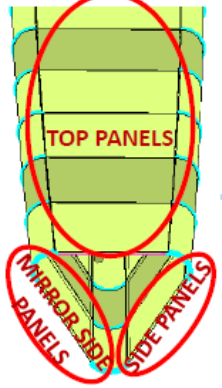
We have three types of macros for top panels, 8mm, 8-12mm and 12-8mm. In order to create top panels we use the already created curved panels as guides.



*With the upd
macro .All leve
level. Also for
1) MCP-04_Fl
2) MCP-04_Fl

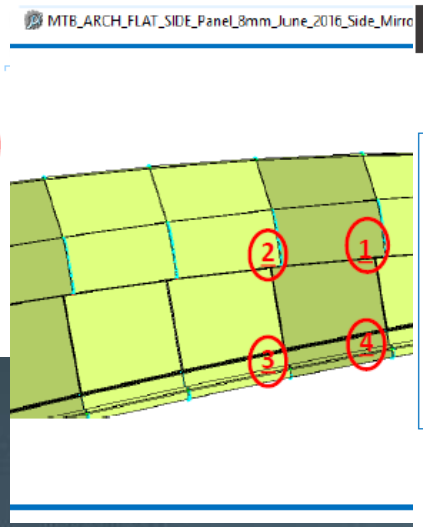
3) MACROS – SIDE PANELS

We have three types of macros for side panels, 8mm, 8-12mm and 12-8mm. In order to create side panels we use the already created curved panels as guides.

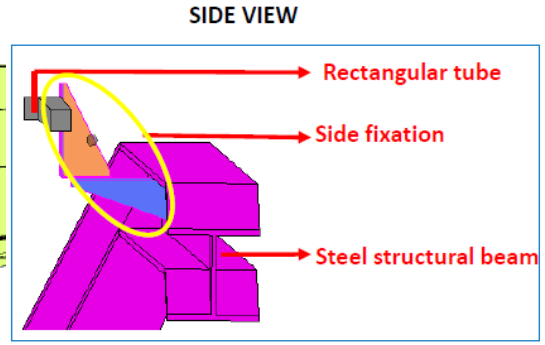


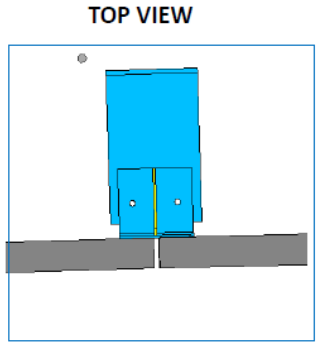
4) MACROS – SIDE MIRROR PANELS

Side mirror panel 8-8mm using macro ***Side mirror panel 12-8mm using macro*** ***Side mirror panel 8-12mm using macro***

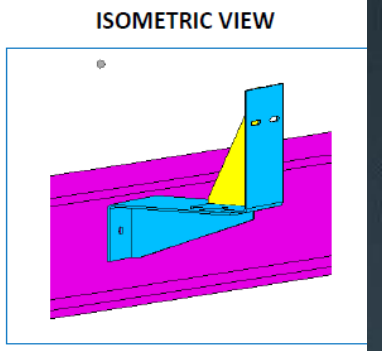


5) MANUAL ADJUSMENTS – SIDE FIXATION





Side fixation must be centered at rectangular tube joint

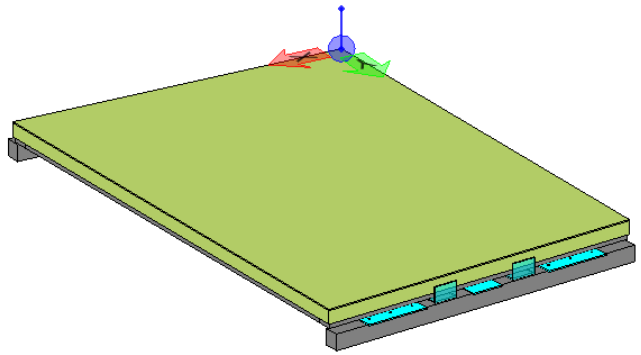


Side fixation must be stretched and/or moved to reach the internal part of structural beam at

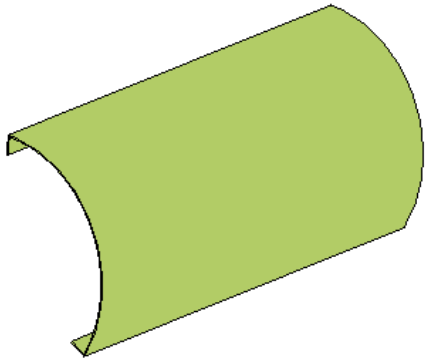
*** TIP : In order to stretch the side fixation we have first to "drop" the cell**

▶WORKFLOW – PANELS CREATION

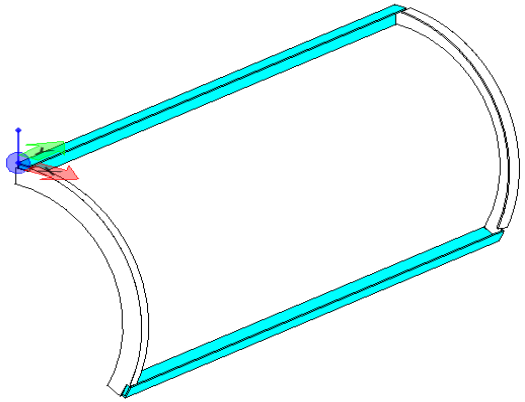
Cladding and subframe creation through automated process



Flat panel and subframe creation



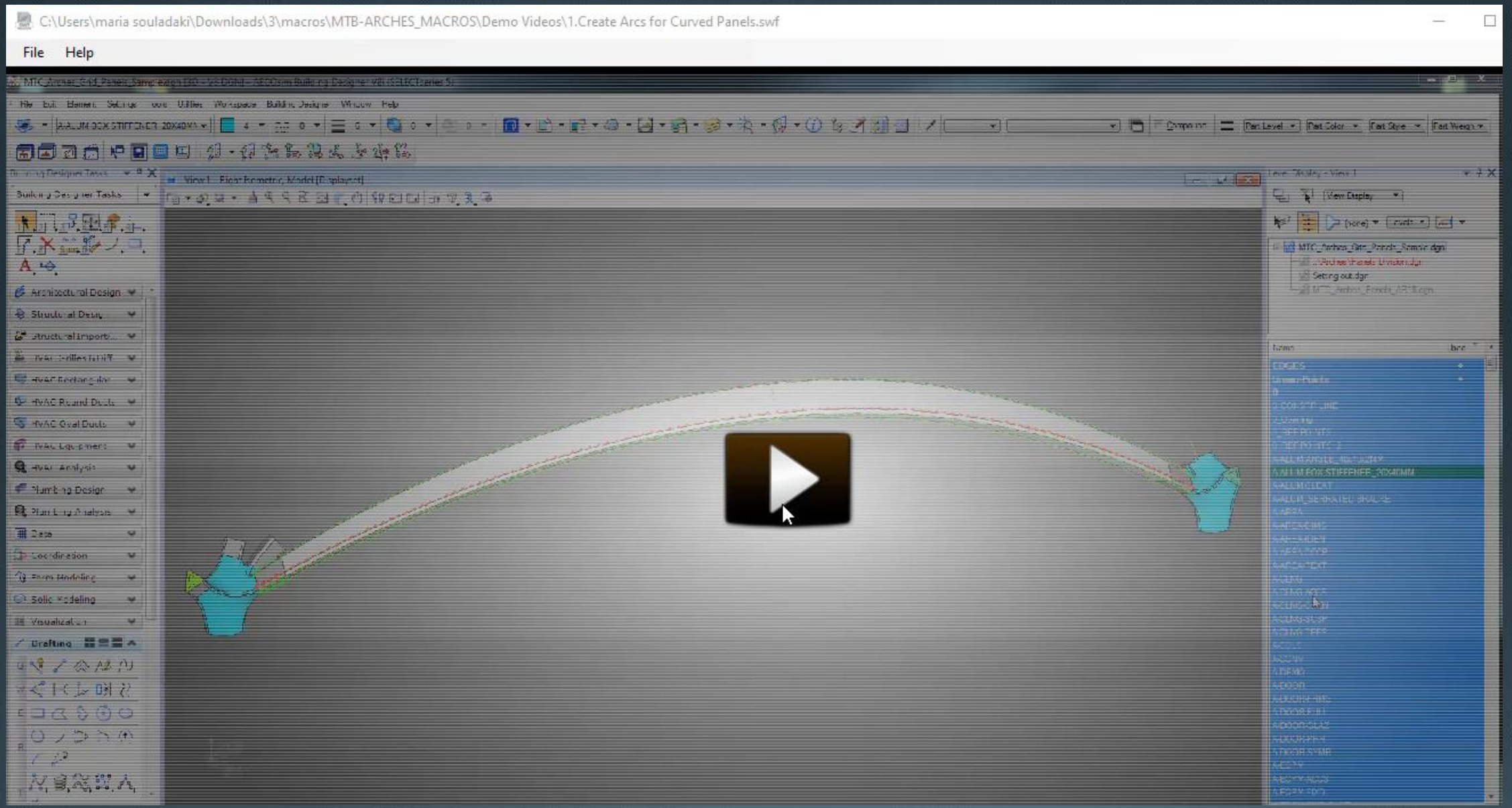
Curved panel creation



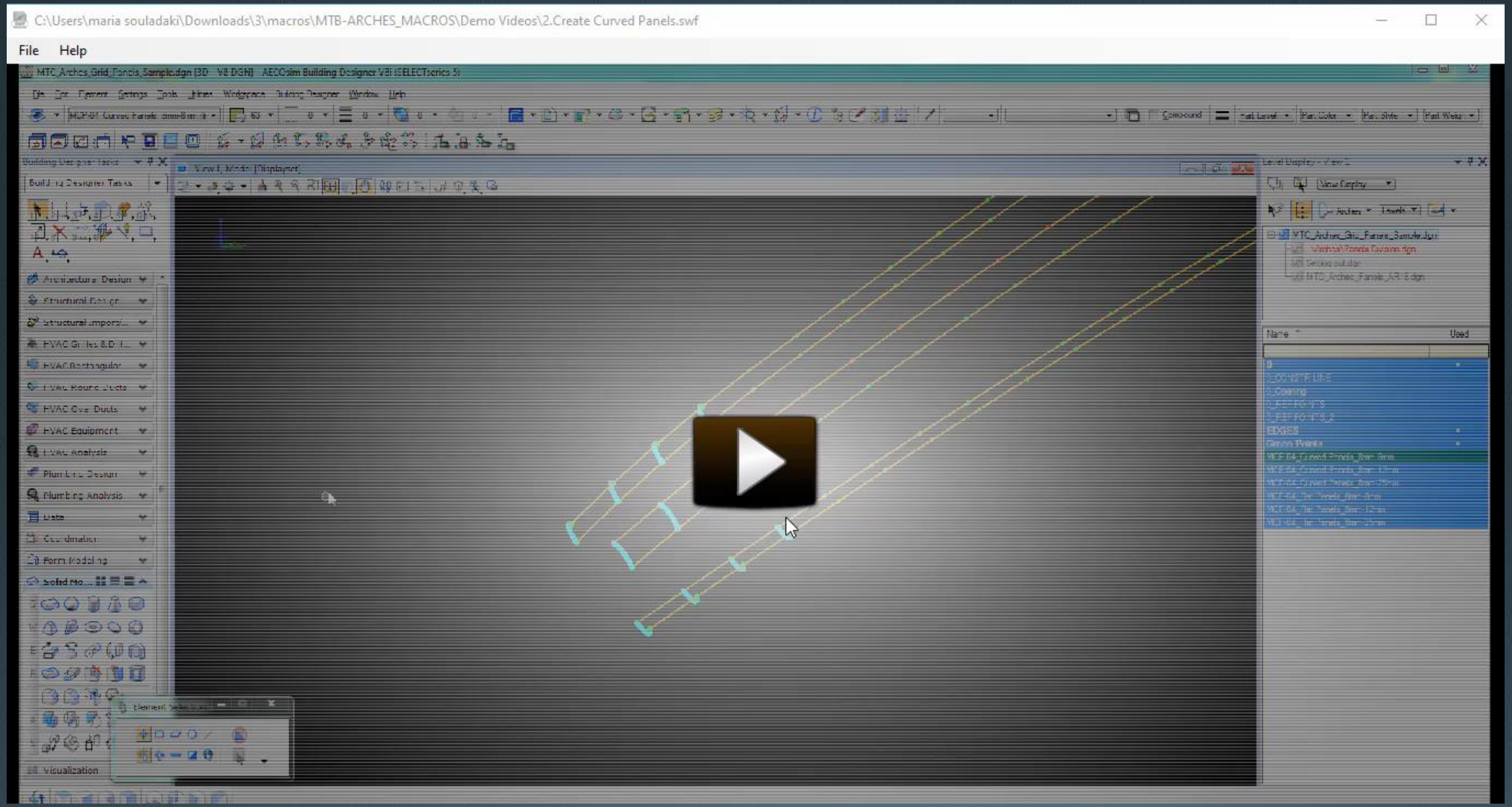
Curved panel subframe creation

By using automation tools work time was reduced by more than 80%

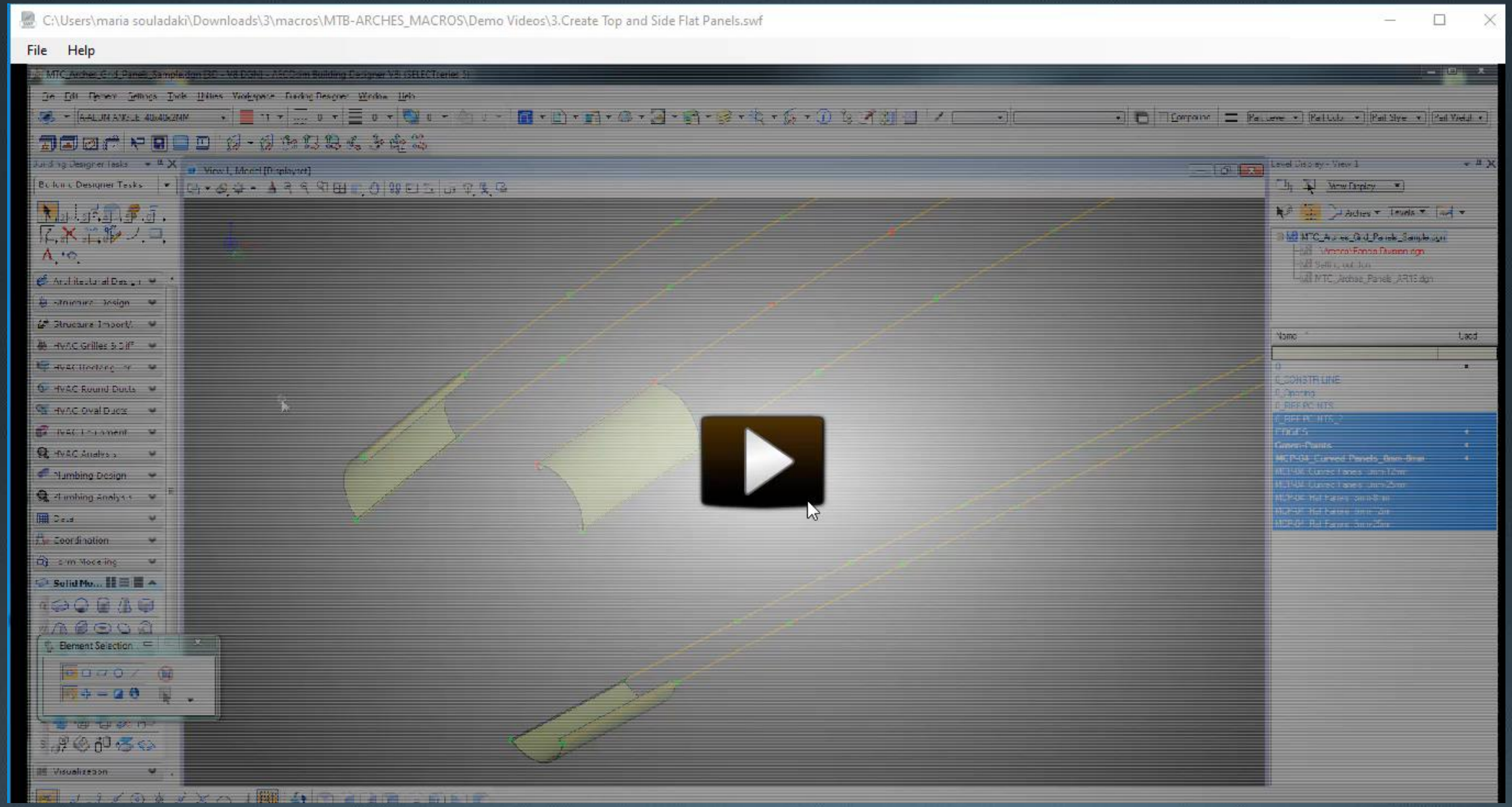
►WORKFLOW - AUTOMATION



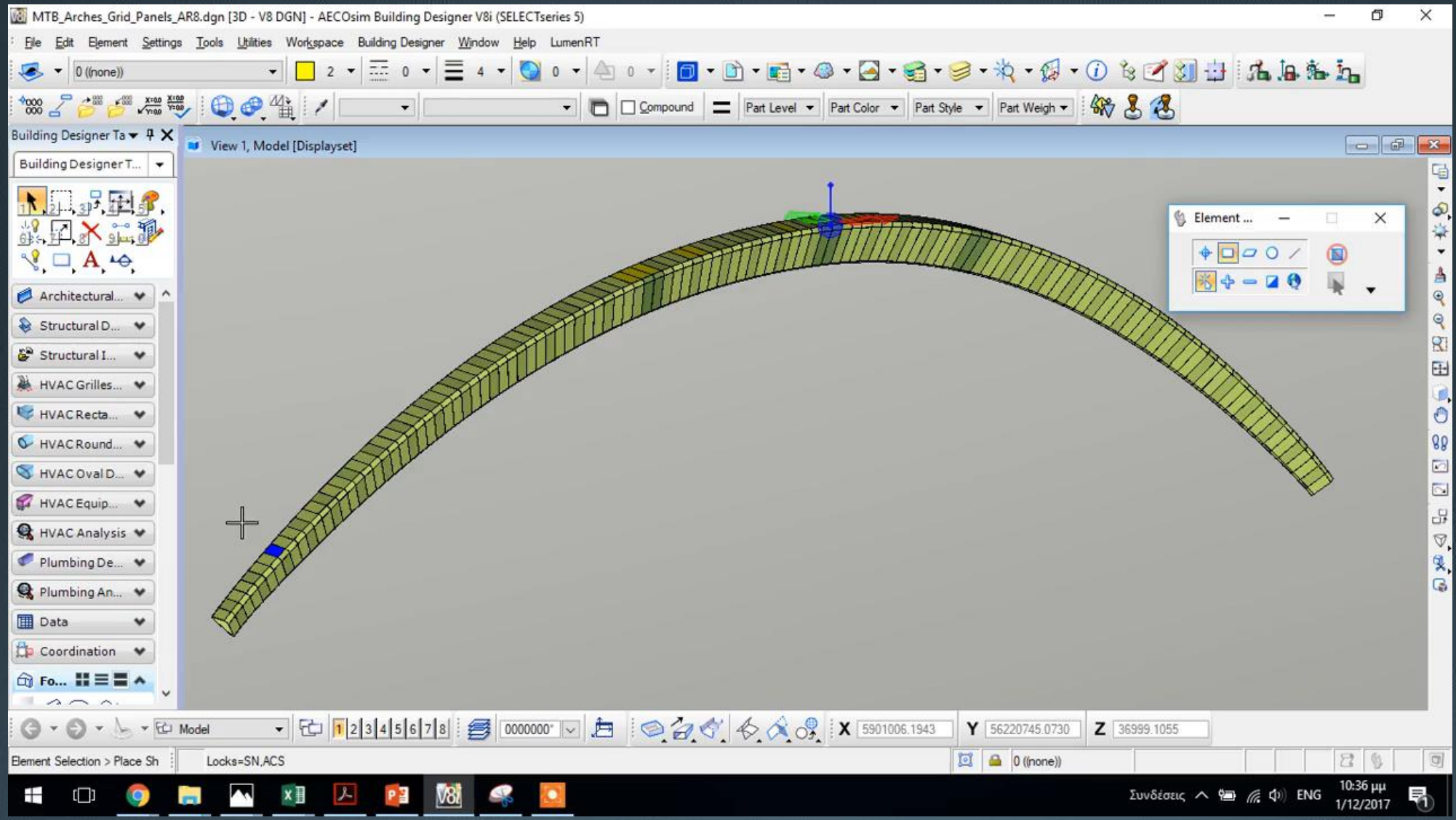
►WORKFLOW - AUTOMATION



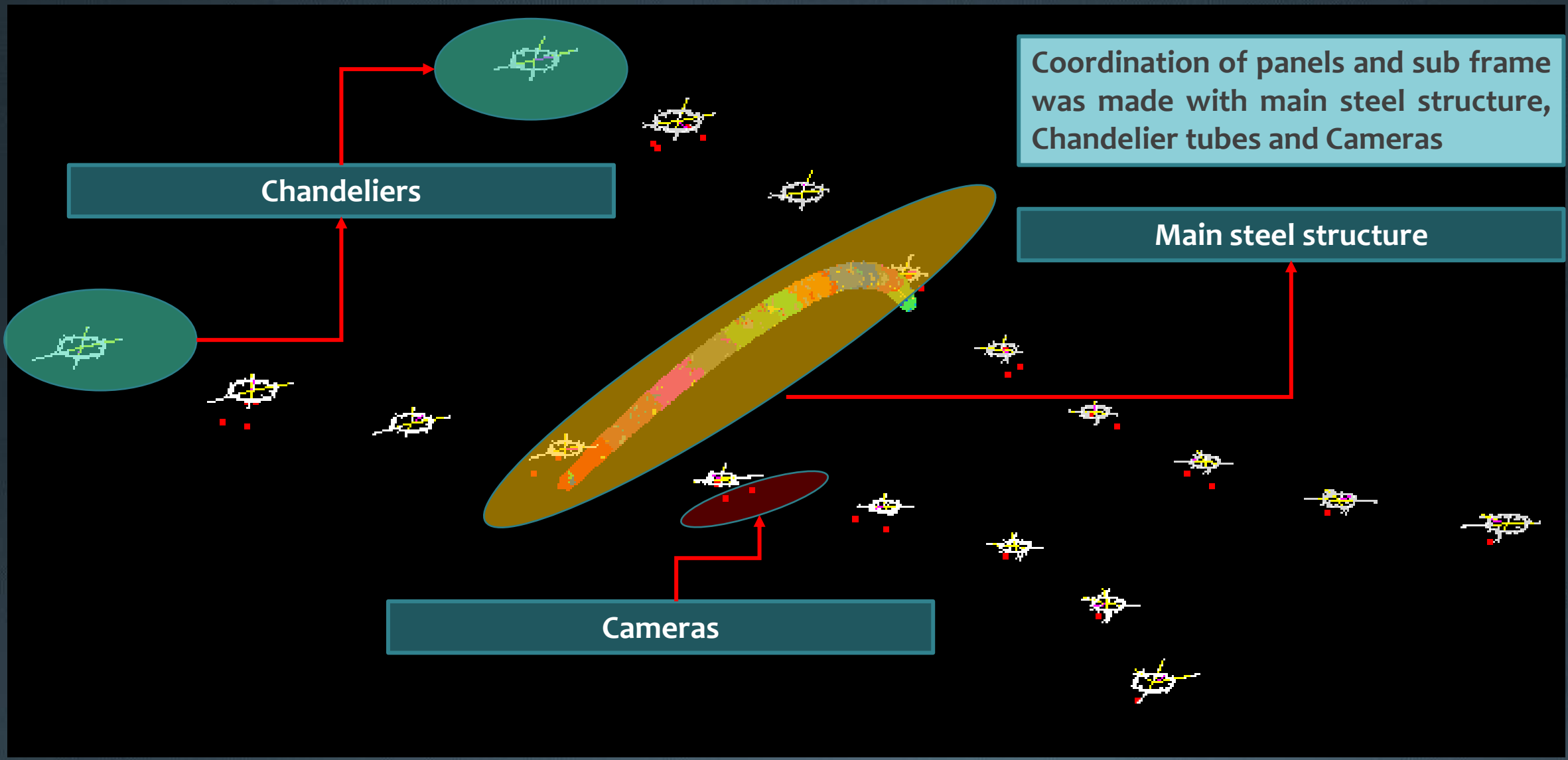
►WORKFLOW - AUTOMATION



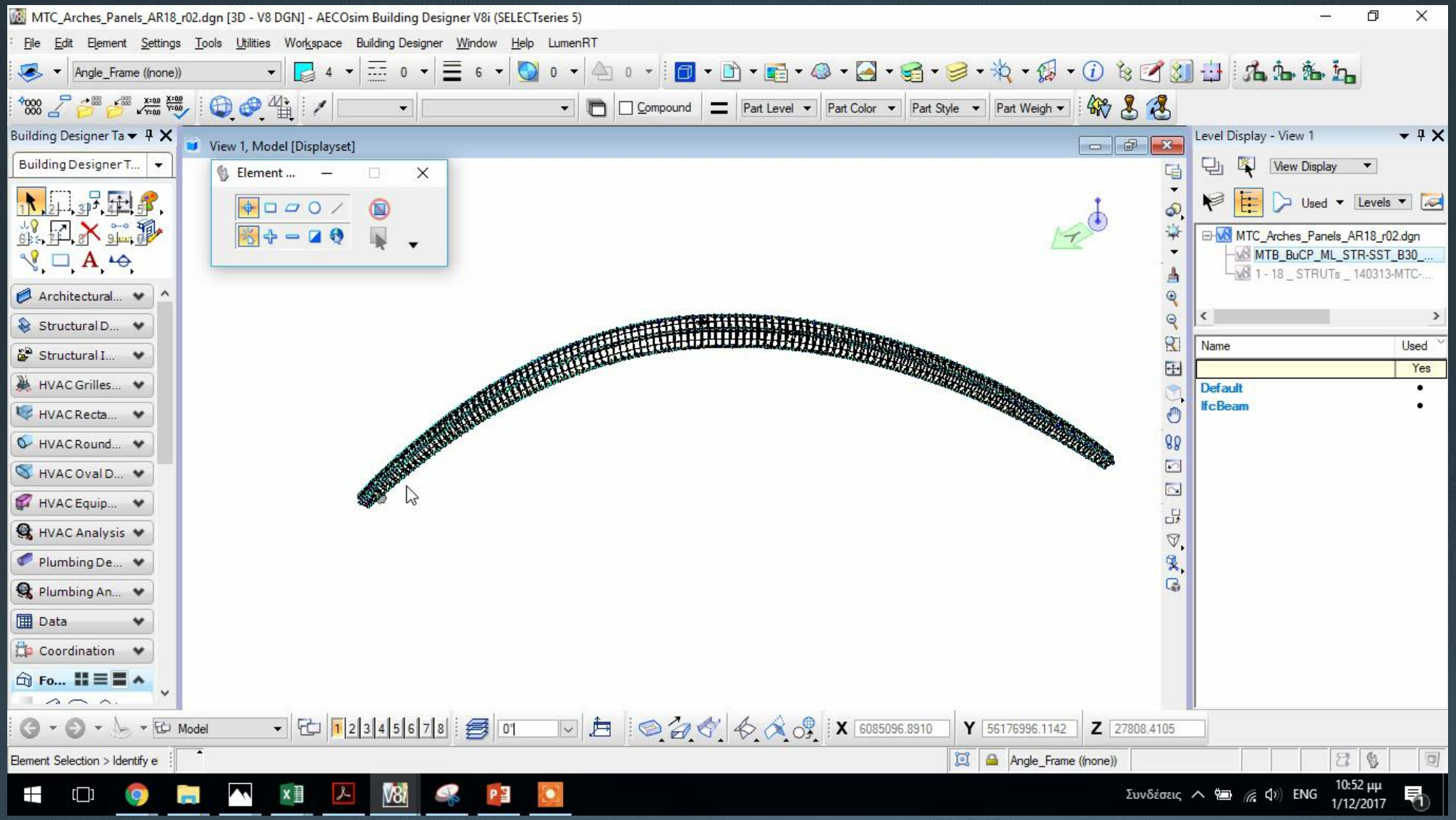
►WORKFLOW – FINAL CLADDING MODEL



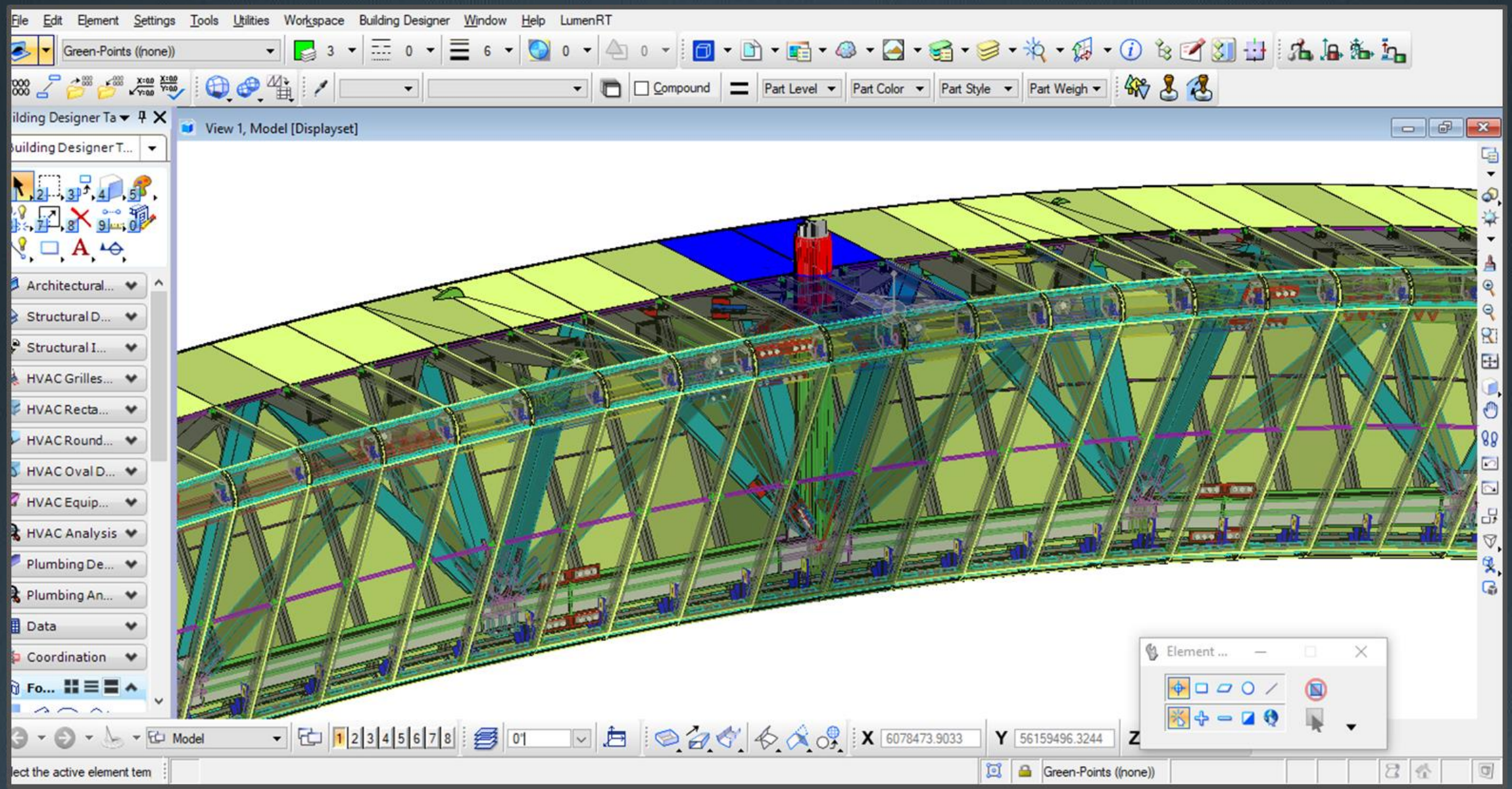
▶COORDINATION



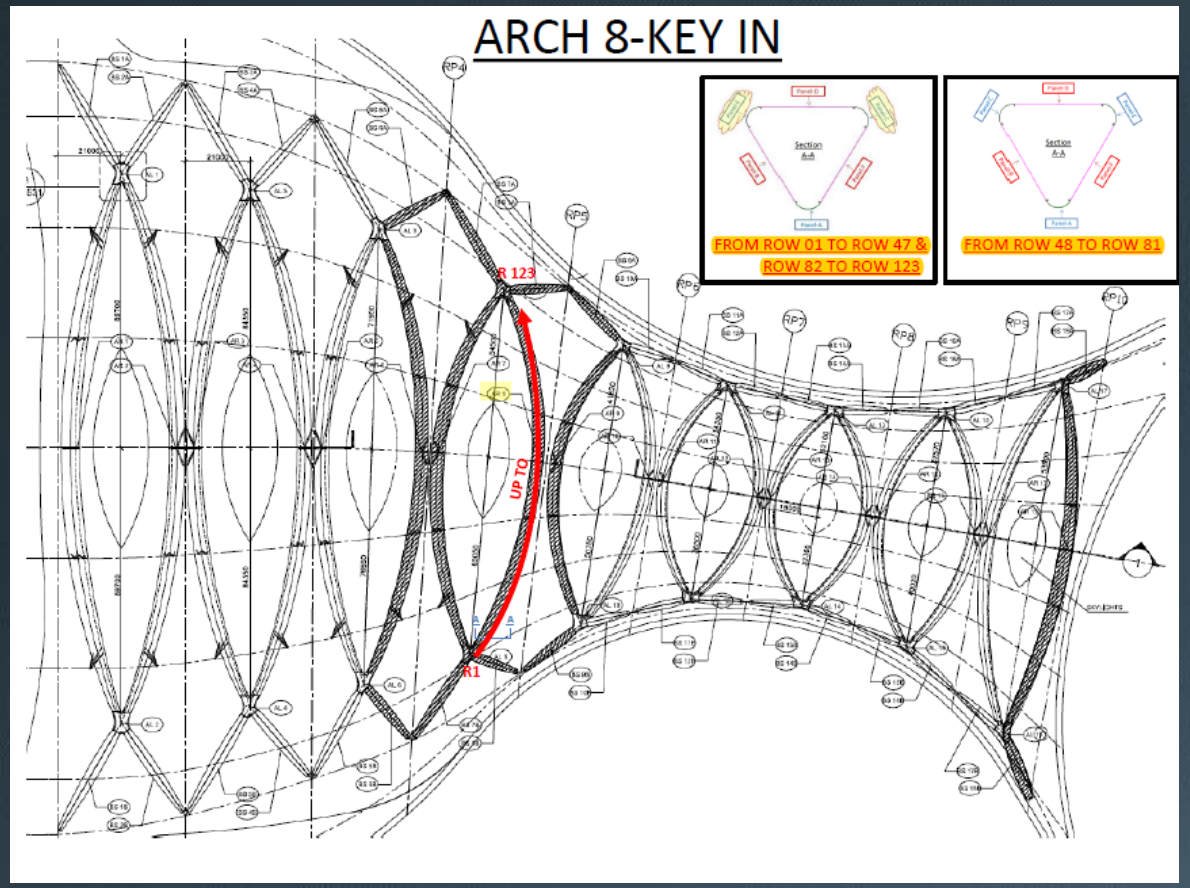
▶COORDINATION

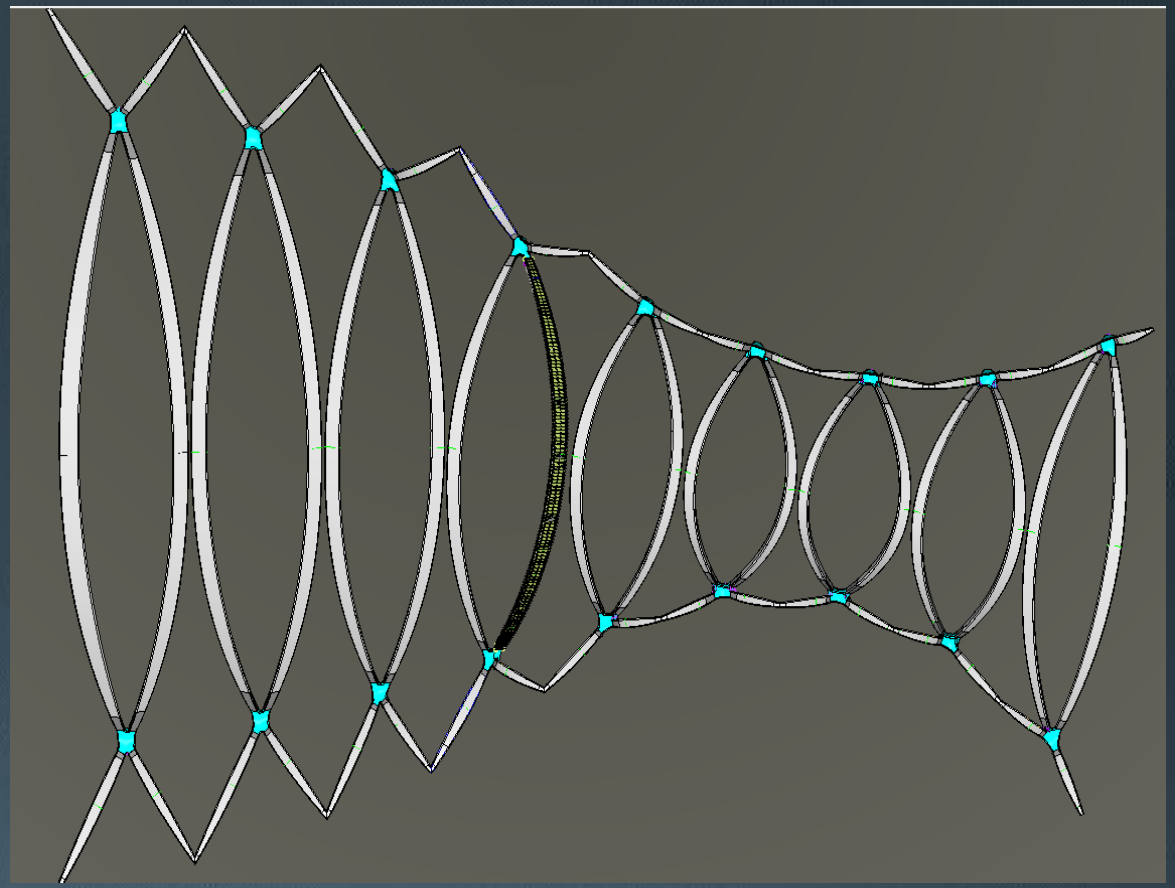


▶COORDINATION – FINAL COMPOSITE MODEL



▶WORK ORDERS


ARCH 8-KEY IN
FROM ROW 01 TO ROW 47 &
ROW 82 TO ROW 123
FROM ROW 48 TO ROW 81
R 123
UP TO
R1



▶WORK ORDERS - CLADDING

INTERNAL WORK ORDER		
QMS/F: 40-07	REVISION: 1	REV. DATE: 26/10/2015

[redacted]

Project Name	*ADIA-MTB*	Job No.	*507850*	W/O Ref.	REV. *1*
Product Category	☑ Alum(AL) ☐ Steel(SL) ☐ Glass(GL) ☐ ACP(CL) ☐ Other (Specify)			ACP-021	Date 20-Jun-17
					T. Pages
Shop Drawing Ref.	401-AG-A-08-20-0.00-ST41-SD-002			Reason For Revision	
Zone / Location Ref:	ARCH CLADDING-ARCH 8			REVISED MODEL BASED ON THE UPDATING DRAWINGS	
BOQ Reference:		BOQ/PS Quantity:	1669 M2		
Total Released Qty.	1669 M2	Balance Quantity:			
Allowed Man-hours:		Planned Production Completion Date:	Start:		
			End:		

Sl.	Product Description	Product Code	Delivery Points	Color / Finish	Qty.	Sqm/LM
1	4MM THK. ALUMINUM COMPOSITE CLADDING		FACTORY	ALM-403 BRONZE METALLIC 504 PVDF	738	1669 M2
				SUMMARY	738	

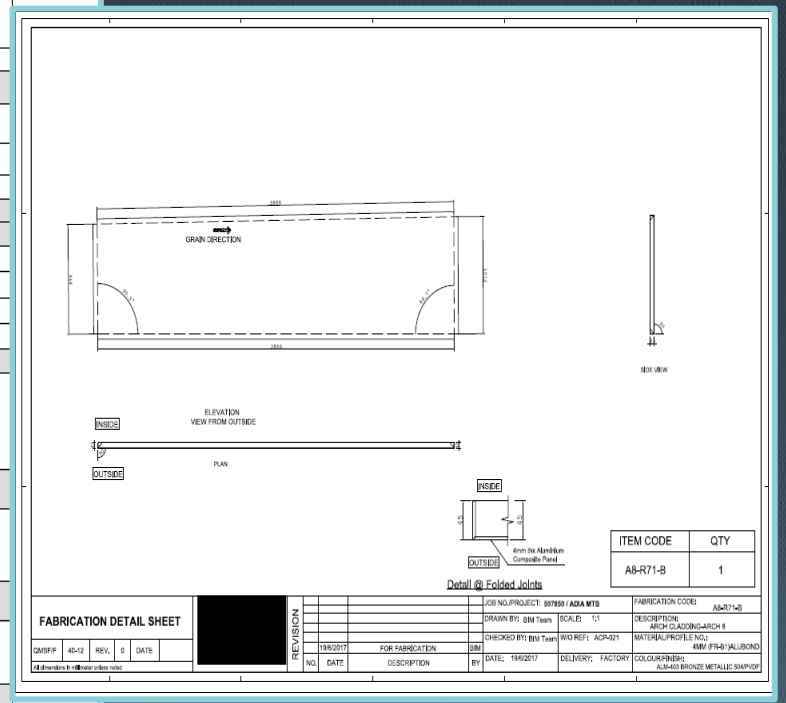
Main / Sub-Components Work Order Details					
W/O Ref.	Product Description	Product Code	Qty	Related Division	Issued Date
AL-147	ALUMINUM WORK ORDER				

Work Order Attachments				Product Process Route			
☑	Cutting List	☐	Fabrication Details	☐	Paint Plant	☐	Cladding Section
☑	Item Sketch	☐	Optimization	☐	Galvanizing Plant	☐	Glazing Section
☐	Material Allocation	☐	Templates / Samples	☐	Alum. Fabrication	☐	Site Installation
☑	Indent To Stores	☐	Other (Specify)	☐	Steel Fabrication	☐	Other (Specify)

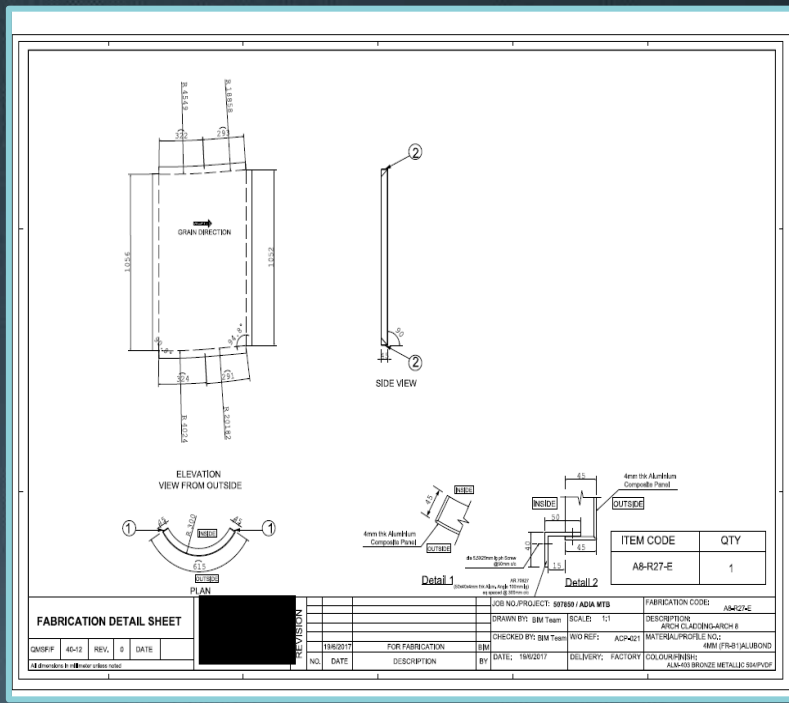
Prepared by: (Designer)	Checked by: (Design Team Leader)	Verified by: (Structural Engineer)	(Technical Manager)
Name : BIM Departme	Name : BIM Departmen	Name :	Name :
Date & Signature 20/06/2017	Date & Signature 20/06/2017	Date & Signature	Date & Signature
Approved by: (QS Manager)	**Material Allocated by: (Allocation Controller)**	**Verfied by: (Production Manager)**	**(Prodn. Planning**
Name :	Name :	Name :	Name :
Date & Signature	Date & Signature	Date & Signature	Date & Signature

Work Order Distribution						
☐ QHSE	☐ Procurement	☐ Material Mngt.	☐ Production	☐ Glass	☐ Project Mngt. Team	☐ Others

Flat panels



Curved panels



▶WORK ORDERS - SUB FRAME

INTERNAL WORK ORDER		
QMS/F: 40-07	REVISION: 1	REV. DATE: 21/06/2015

[redacted]

Project Name	*ADIA-MTB*		Job No.	*507850*	W/O Ref.	REV. *1*
Product Category	☑ Alum(AL) ☐ Steel(SL) ☐ Glass(GL) ☐ ACP(CL) ☐ Other (Specify)				AL-147	Date 20-Jun-17
						T. Pages
Shop Drawing Ref.	401-AG-A-08-20-0.00-ST41-SD-002				Reason For Revision	
Zone / Location Ref:	ARCH CLADDING-ARCH 8				REVISED MODEL BASED ON THE UPDATING DRAWINGS	
BOQ Reference:			BOQ/PS Quantity:	8626 Nos.		
Total Released Qty.	8626	Nos.	Balance Quantity:			
Allowed Man-hours:			Planned Production Completion Date:	Start:		
				End:		

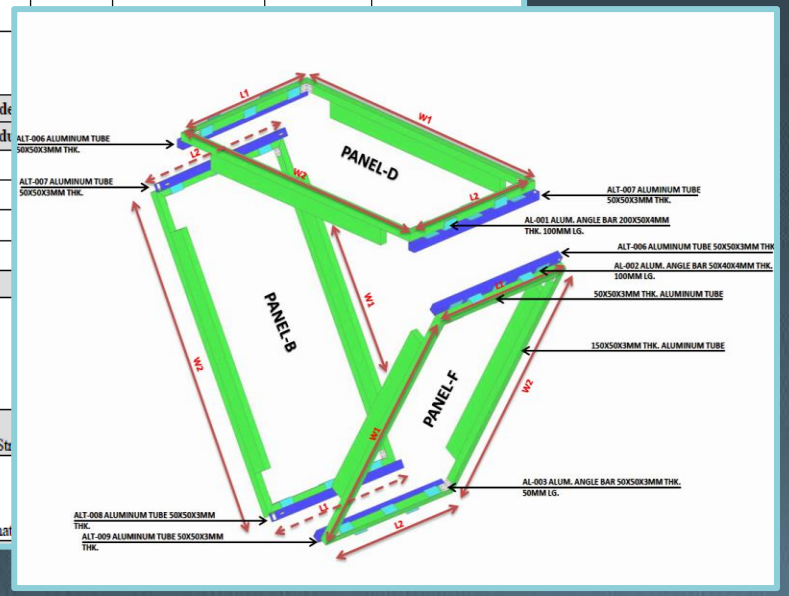
Sl.	Product Description	Product Code	Delivery Points	Color / Finish	Qty.	Sqm/LM
1	ALUMINUM FRAME		FACTORY		369	
2	ALUMINUM ANGLE		FACTORY		8257	

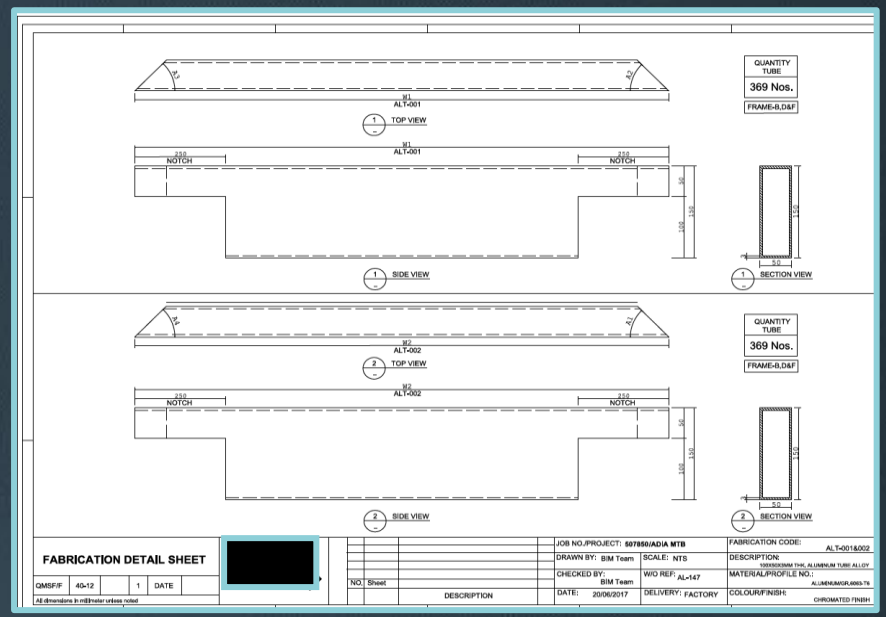
Main / Sub-Components Work Orde

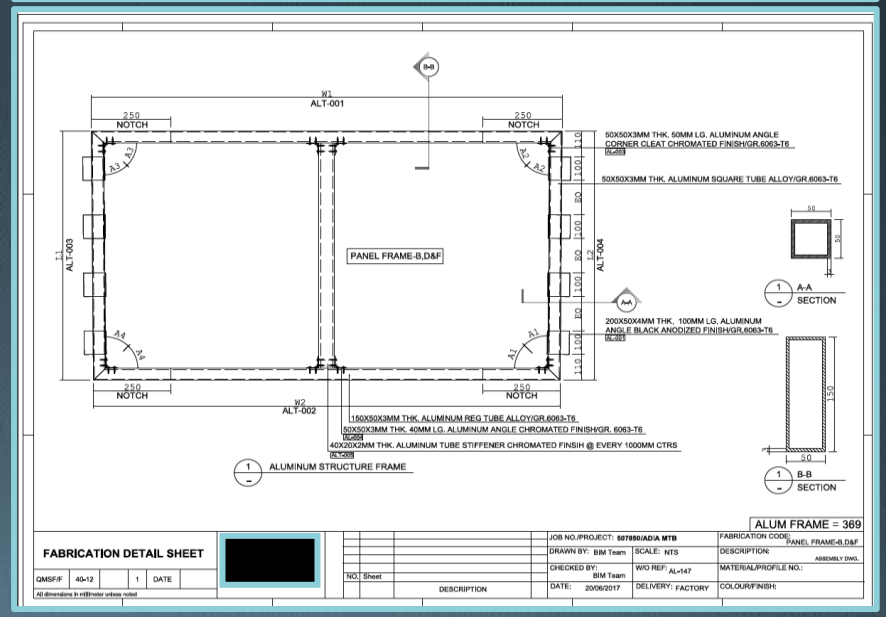
W/O Ref.	Product Description	Produ
ACP-021	ALUMINUM CLADDING WORK ORDER	

Work Order Attachments					
☑	Cutting List	☑	Fabrication Details	☐	
☑	Item Sketch	☐	Optimization	☐	
☐	Material Allocation	☐	Templates / Samples	☐	
☑	Indent To Stores	☐	Other (Specify)	☐	

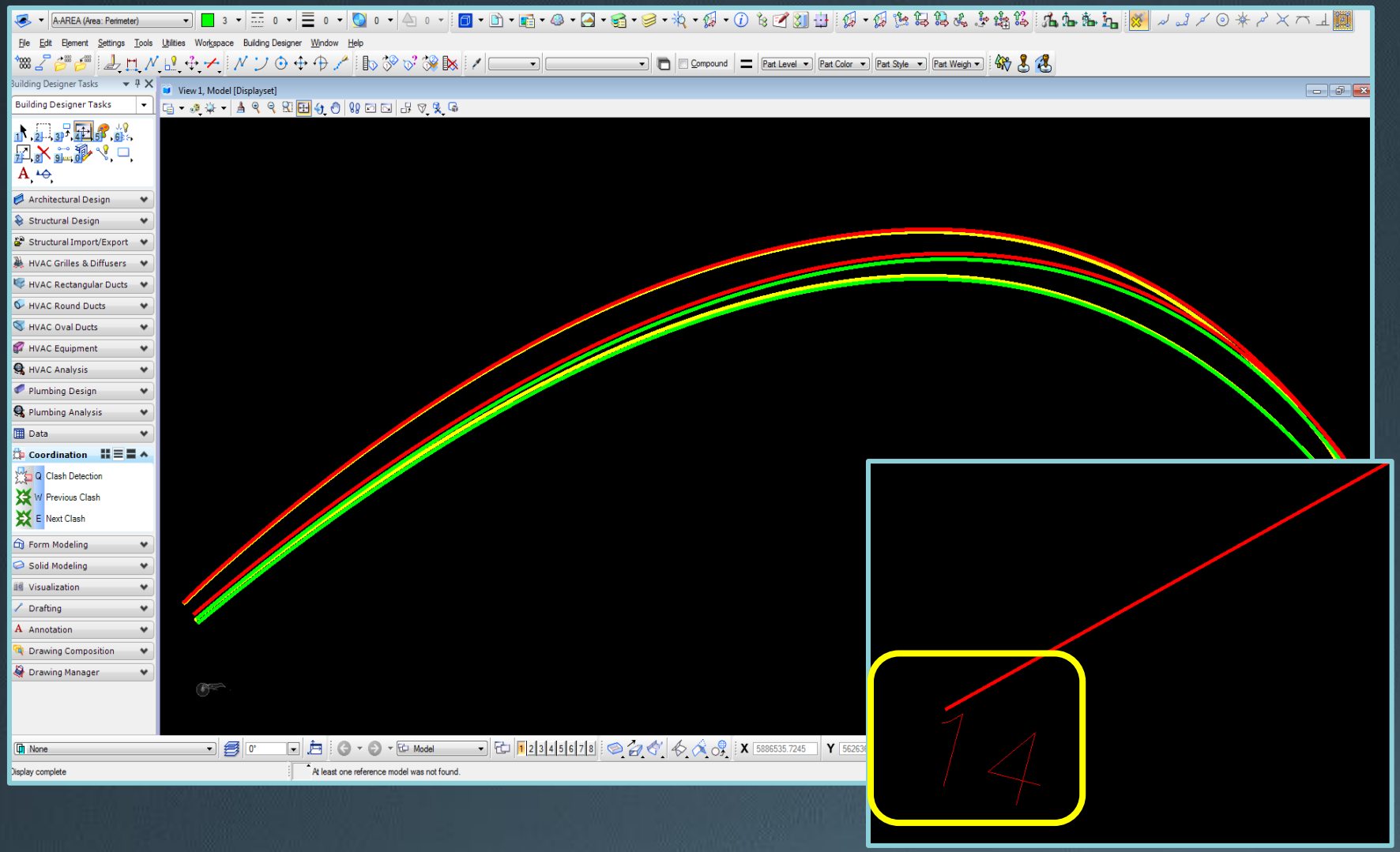
Prepared by: (Designer)	Checked by: (Design Team Leader)	(Stı
Name : BIM Department	Name : BIM Department	Name :
Date & Signature 6/20/2017	Date & Signature 6/20/2017	Date & Signat







▶INSTALLATION – COORDINATES EXTRACTION



Each color represents a side of the arch (red for top, green for right, yellow for left) and each line the start and end of each panel.

Every line has a unique number at each start and end which is the coordinate number found in the corresponding excel file

▶INSTALLATION – COORDINATES EXTRACTION

Top

	A	B	C	D
1	COORDINATE NUMBER	X	Y	Z
2	0	5865094.7403	56201208.1386	32440.2636
3	1	5864539.0161	56200691.4203	31803.1488
4	2	5866228.9858	56199830.7466	30890.8539
5	3	5866850.9129	56200313.7350	31492.2157
6	4	5866803.2166	56202814.8521	34305.1300
7	5	5866235.3926	56202276.6155	33697.1806
8	6	5868098.6486	56201327.5120	32691.0990
9	7	5868711.0464	56201843.0286	33274.9922
10	8	5868523.5066	56204468.4480	36117.4736
11	9	5867954.7075	56203917.0629	35522.3554
12	10	5869950.1541	56202900.5882	34444.9001
13	11	5870561.9902	56203430.0512	35016.7786
14	12	5865659.0255	56201735.4374	33070.5305
15	13	5865099.7718	56201212.1030	32445.1213
16	14	5866855.8952	56200317.6662	31497.0209
17	15	5867472.9413	56200811.5595	32091.2188
18	16	5866230.4252	56202272.4782	33692.4298
19	17	5865666.5156	56201741.5207	33077.7296
20	18	5867480.3827	56200817.6080	32098.3667
21	19	5868093.7092	56201323.3948	32686.3781
22	20	5867375.0942	56203360.5711	34912.4057
23	21	5866808.1620	56202819.0334	34309.8308
24	22	5868715.9889	56201847.2093	33279.6884
25	23	5869326.9878	56202366.2903	33858.4766
26	24	5867949.7651	56203912.8065	35517.7192
27	25	5867382.5094	56203366.8989	34919.4077
28	26	5869334.4001	56202372.6176	33865.4741
29	27	5869945.2147	56202896.3325	34440.2685
30	28	5869671.8419	56205593.2539	37303.4688
31	29	5869103.7104	56205034.0053	36718.4592

Right

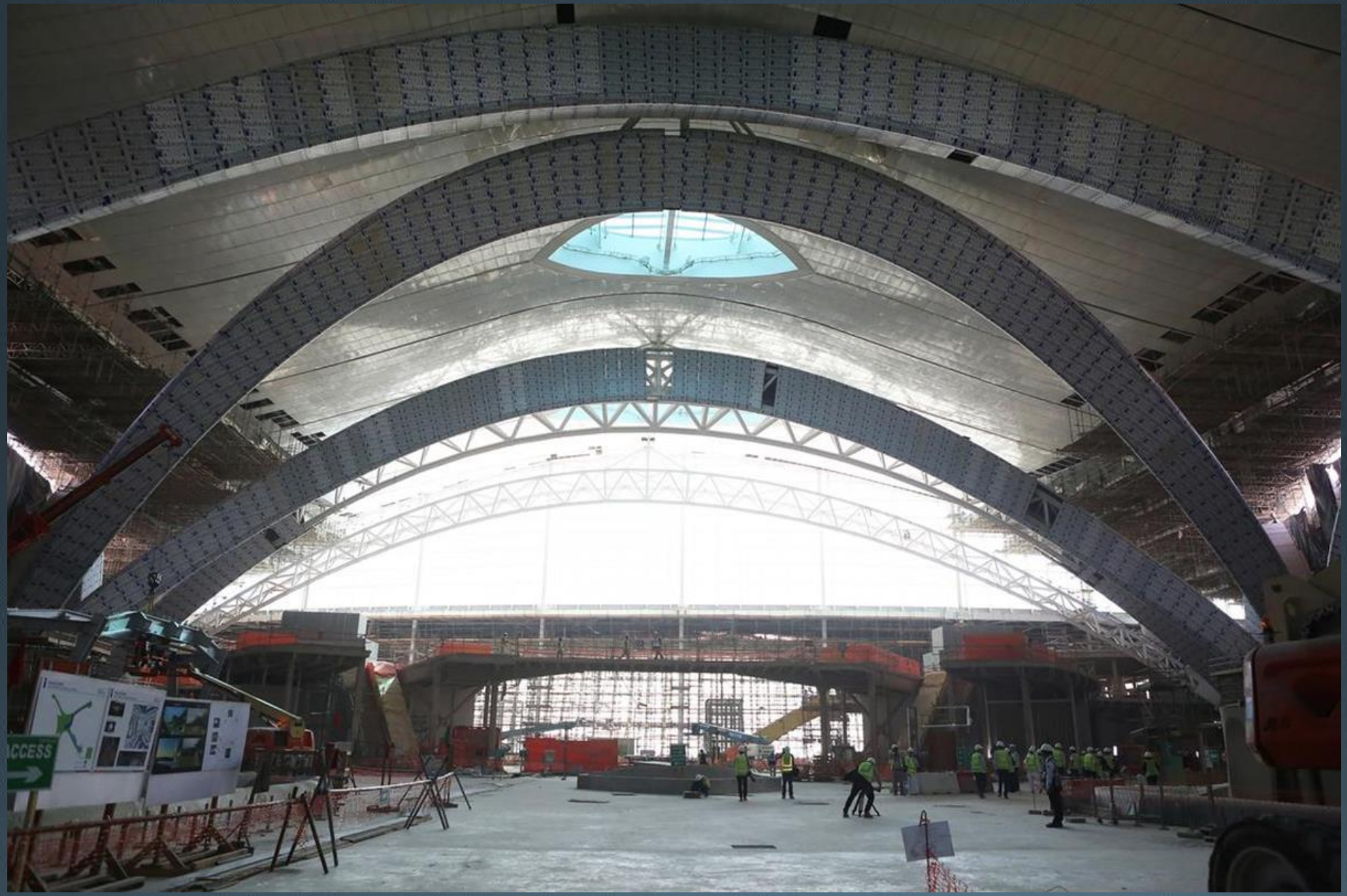
	A	B	C	D
1	COORDINATE NUMBER	X	Y	Z
2	624	5865747.4709	56202565.1275	30453.9987
3	625	5865168.1409	56202022.9099	29893.8288
4	626	5864327.1503	56201131.3768	31604.3691
5	627	5864881.7270	56201646.2839	32239.5222
6	628	5866330.1681	56203113.2164	31015.5294
7	629	5865752.0397	56202569.3812	30459.1654
8	630	5864886.1774	56201650.4307	32244.5571
9	631	5865444.3204	56202171.9105	32868.0079
10	632	5866915.0910	56203666.1495	31576.9568
11	633	5866337.0491	56203119.6643	31023.1179
12	634	5865451.0810	56202178.2490	32875.4656
13	635	5866013.7991	56202707.3558	33488.2868
14	636	5867498.8195	56204221.2905	32133.9023
15	637	5866919.7125	56203670.5087	31581.9446
16	638	5866018.3305	56202711.6335	33493.1794
17	639	5866584.8306	56203248.0883	34099.3235
18	640	5868081.3110	56204779.1416	32685.8429
19	641	5867503.4322	56204225.6735	32138.8184
20	642	5866589.3949	56203252.4282	34104.1897
21	643	5867155.0877	56203792.1315	34704.9232
22	644	5868666.0010	56205343.0326	33236.4061
23	645	5868088.2222	56204785.7587	32693.1534
24	646	5867161.9501	56203798.7045	34712.1835
25	647	5867727.9622	56204342.7688	35308.6674
26	648	5869249.4272	56205909.7171	33781.8643
27	649	5868670.6194	56205347.4874	33241.2534
28	650	5867732.5312	56204347.1784	35313.4643
29	651	5868299.9960	56204896.7551	35906.8156
30	652	5869831.5672	56206479.2055	34322.1710
31	653	5869254.0482	56205914.2083	33786.6763

Left

	A	B	C	D
1	COORDINATE NUMBER	X	Y	Z
2	1248	5865050.3139	56201302.9469	29138.5929
3	1249	5865586.4662	56201803.2278	29660.1461
4	1250	5866435.2140	56200050.8098	30458.1330
5	1251	5865855.9011	56199614.6375	29895.7842
6	1252	5865591.5663	56201807.1276	29665.0886
7	1253	5866170.3561	56202349.6079	30225.5374
8	1254	5867060.4159	56200536.0634	31062.6401
9	1255	5866440.1867	56200054.6110	30462.9486
10	1256	5866175.4275	56202353.6055	30230.4327
11	1257	5866752.9671	56202897.7282	30787.1017
12	1258	5867680.7192	56201032.2855	31659.9531
13	1259	5867065.3595	56200539.9589	31067.4084
14	1260	5866760.4979	56202903.8450	30794.3391
15	1261	5867338.0351	56203450.5746	31348.4379
16	1262	5868299.7595	56201542.4808	32253.4594
17	1263	5867688.1217	56201038.2968	31667.0640
18	1264	5867343.0360	56203454.7404	31353.2206
19	1265	5867921.7721	56204005.6983	31905.3657
20	1266	5868915.3724	56202060.4869	32840.4274
21	1267	5868304.6663	56201546.5671	32258.1494
22	1268	5867926.7412	56204009.8996	31910.0894
23	1269	5868504.1619	56204563.5884	32457.3488
24	1270	5869529.5994	56202582.1186	33422.2856
25	1271	5868920.2921	56202064.6455	32845.1017
26	1272	5868511.6013	56204569.9362	32464.3740
27	1273	5869088.9244	56205127.4292	33007.8603
28	1274	5870146.1116	56203110.5179	34002.4641
29	1275	5869536.9889	56202588.4228	33429.2613
30	1276	5869093.8912	56205131.7065	33012.5195
31	1277	5869672.3326	56205694.1097	33553.3158

▶INSTALLATION

►INSTALLATION



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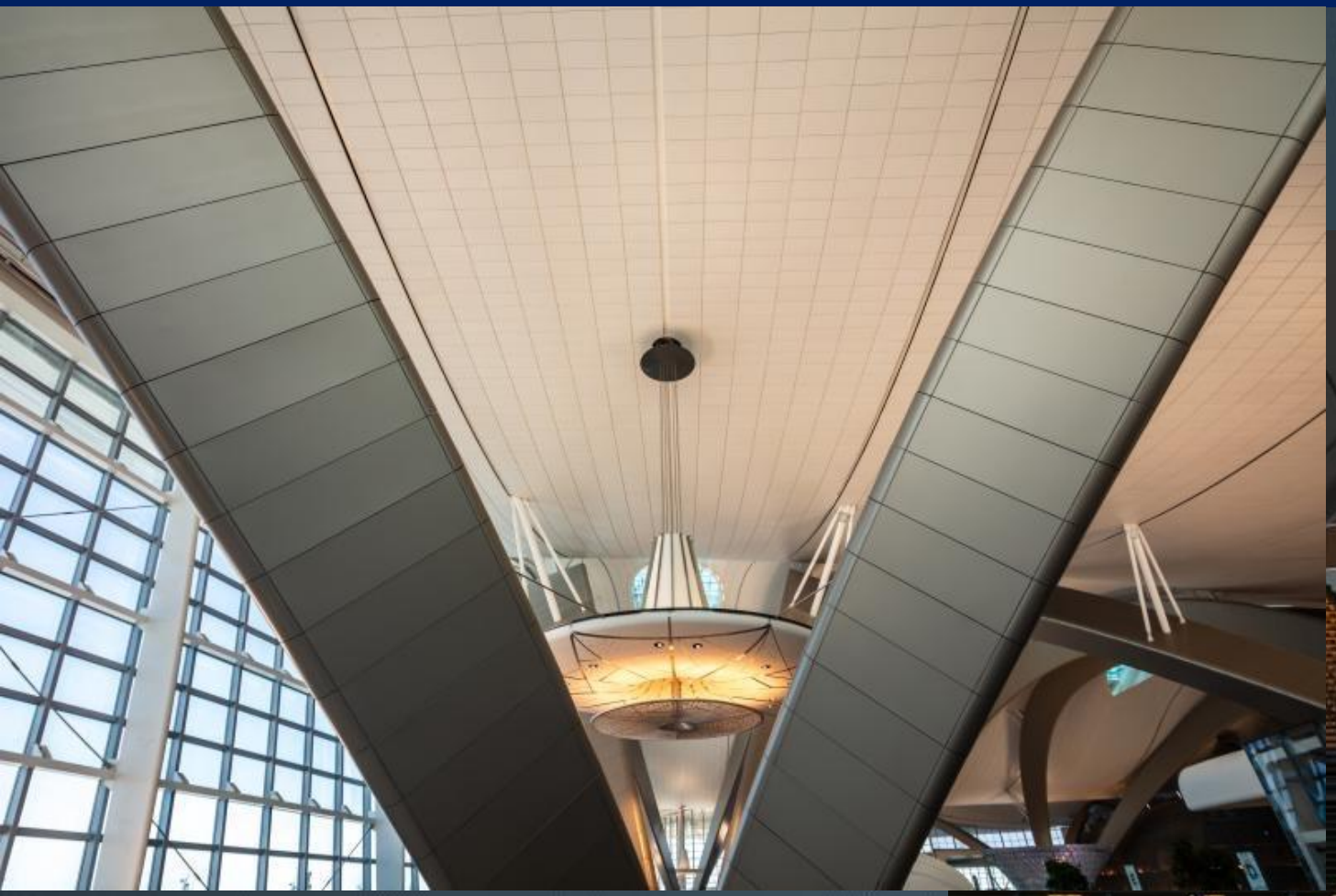
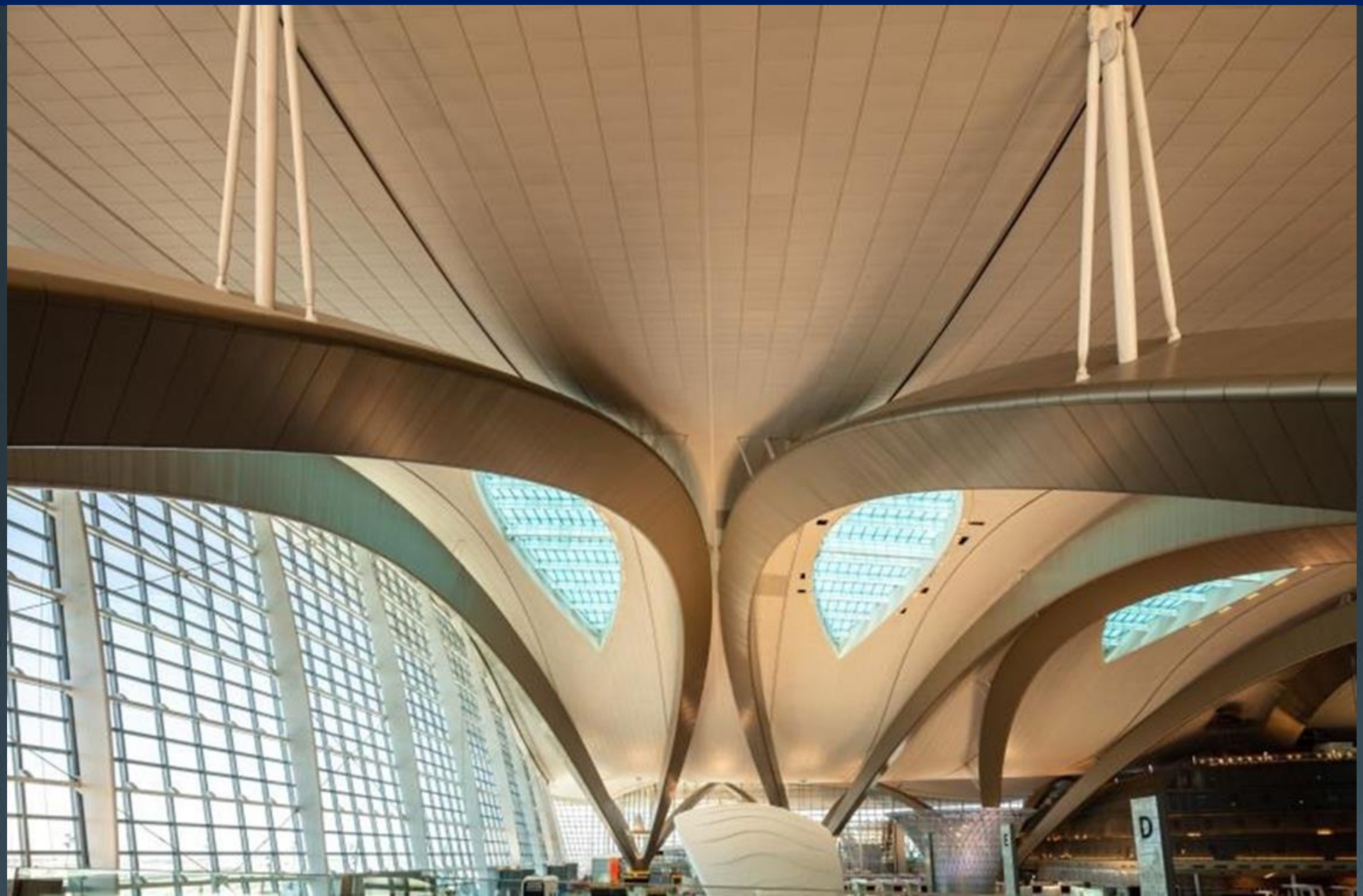
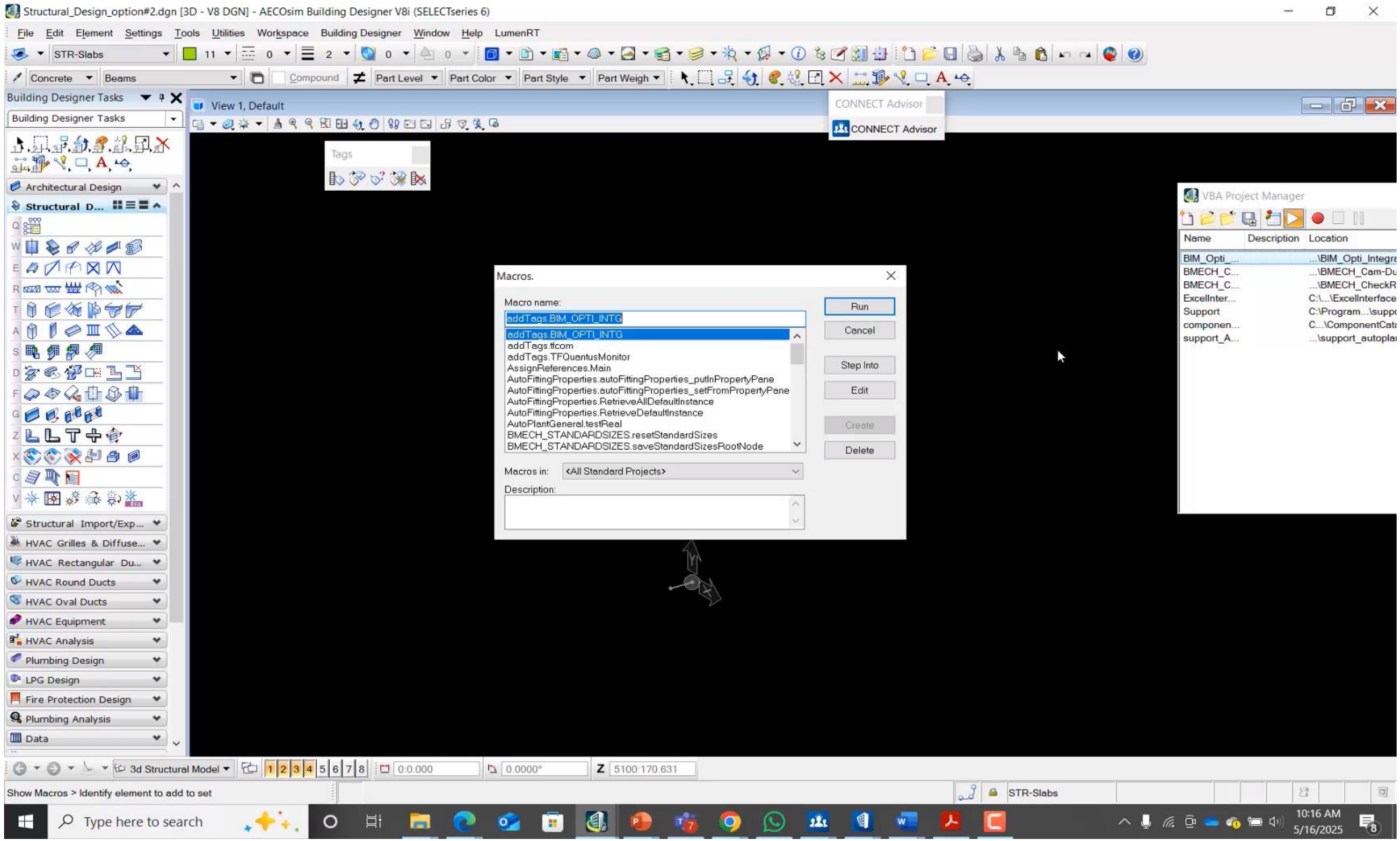


►INSTALLATION



BIM FOR FABRICATION

CASE STUDY: ICONIC TERMINAL PROJECT ARCHES CLADDING



OPTIONEETING AI TOOL

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